INTERVIEW: OPTUS CEO BOB MANSFIELD

AUSTRALIAN
communications

DECEMBER/JANUARY
1993-94

The Networking and Telecommunications Management Magazine

$5.50

A CHRISTMAS WAN

Eight network integrators present their latest WAN solutions — Guess who's not included?

AN AUSTRALIAN NII

Do we need a national information infrastructure policy?

FIBRE ETHERNET

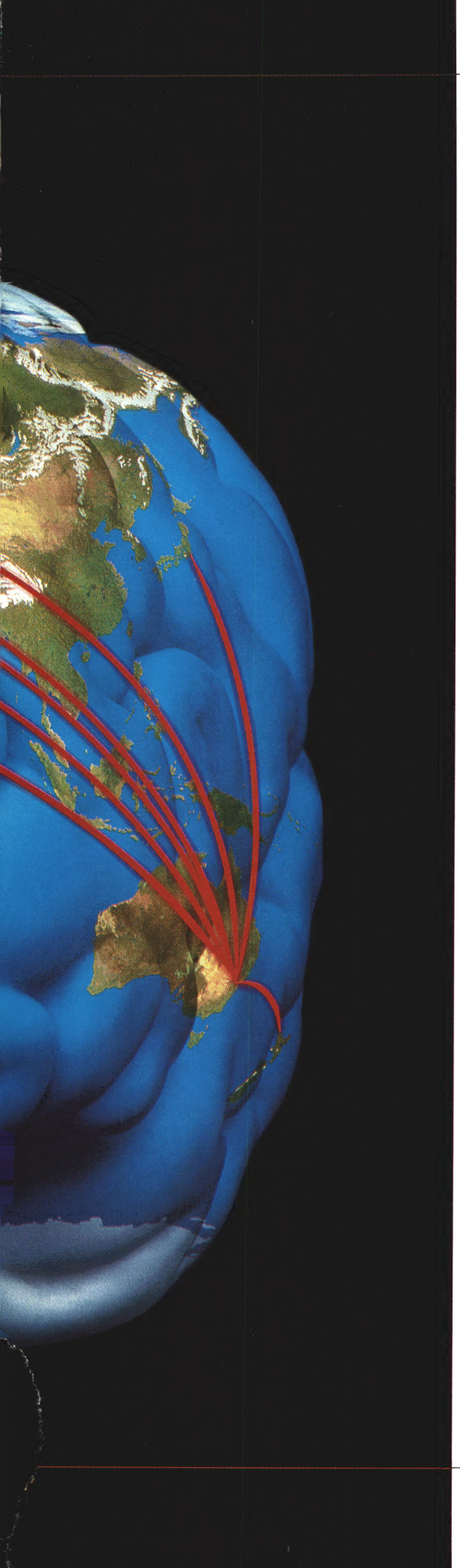
How 10Base-F helps stretch wiring backbones

NETWARE 4.0

The work behind the network

WORKGROUP NETWORKING

The implications for protocol choices and systems management



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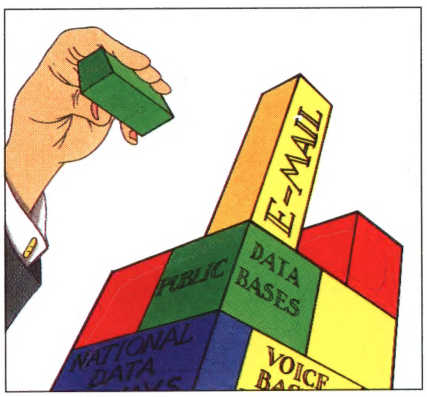
Cover: John Doughty



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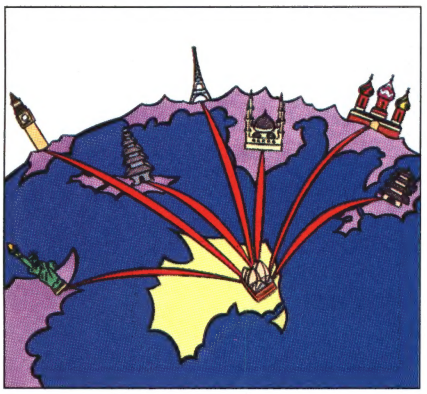
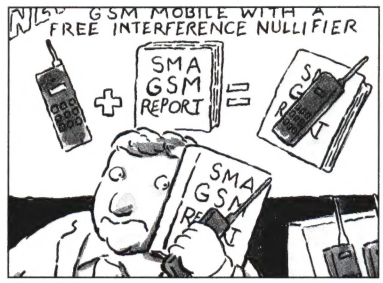


WORKGROUP NETWORKING 99

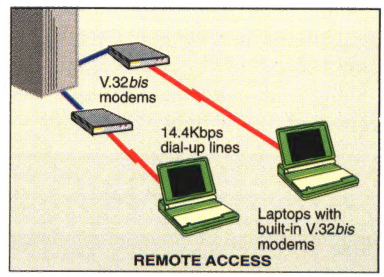
Workgroup networking may well revolutionise the industry. But what is it? A workgroup network is characteristically an abstracted environment. This means that many of the traditional applications functions which are found in a typical network are either absent or structured very differently. In last month's edition, Graeme Le Roux defined the foundation concepts relevant to workgroup networking and went on to discuss two of its major elements — groupware and messaging. This month, Graeme looks at some of the implications of workgroup networking in the areas of network operating systems, protocol choices, hardware platforms and systems management.

ANALYSIS



TECHNOLOGY

PRODUCT LEADERS



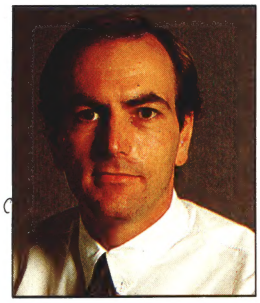
OPINION

INTERVIEW

LEGAL LINE

DEPARTMENTS

The Fruits of Competition



The repackaging of Telecom's network modernisation plans under its Future Mode of Operation (FMO) program provides the best evidence yet that the partial deregulation of telecommunications in Australia is having a positive effect. After years of fobbing off complaints about the slowness of network modernisation with tales of woe about capital constraints and the burden of its social obligations, Telecom has suddenly come up with a plan to build a fully-digital national network eight years earlier than previously thought possible and within its existing expenditure forecasts. Whether it can actually be achieved is of course yet to be seen, but the fact that such a radical plan can even be seriously put in place is a breathtaking development for which Telecom's senior management should be congratulated.

However, it is a little hard not to temper that congratulations with some cynicism. If such an enormous advance can be made with apparently little sacrifice it makes you wonder why it has taken until now to realise it. Presumably the courage to break up the Telecom suppliers' club holds the key. Of course political constraints inevitably got in the way and that's why the three switch suppliers remain, but Frank Blount's team of negotiators have well and truly signalled that the good old days of slow deliveries, second rate technology and fat contracts for all are over.

No such constraints hold back Optus Communications which has managed to roll out its network in remarkable time using the best technology available and driving a hard bargain in the process and in this edition Optus CEO, Bob Mansfield, talks with Liz Fell about his company's progress to date. Via the preselection ballot, Optus has gained (as opposed to won) a significant share of long distance traffic and at the same time has been doing very nicely reselling cellular mobile airtime. But where are its business services? Where are the benefits for the lobby group which played such a large part in the introduction of competition in the first place? While the business community waits with increasing impatience, on page 19 Stuart Corner examines what Optus has available for business now.

Also in this issue we present our third annual look at what wide area network vendors in Australia currently have on offer (see 'AusComms Buys a WAN III' starting on page 61). This year sees responses from Toren Computer Communications, Digital Equipment Corporation, JNA, 3Com ANZA, MPA International, GEC Alsthom, Datacraft and Ungermann-Bass. In the first installment of this special feature article Graeme Le Roux sifts through a wealth of detail to examine solutions from five vendors. A couple of interesting points are immediately obvious: Telecom's ISDN service is a universal choice as a WAN backbone; and, where specified, the network operating system of choice is either Windows NT or Banyan VINES. It would be very unwise to draw conclusions from such a small sample, but could this be indicative of a less dominant future for Novell's NetWare?

MA Smeaton

Readership Survey Results

In August, *Australian Communications* conducted an independent survey of 4,000 domestic subscribers in order to determine an accurate profile of the magazine's readership. Subscribers received, with their August issue, a survey form which they were asked to complete and return to consultancy firm Price Waterhouse, which we commissioned to compile and analyse the results. As an added incentive for readers to respond, *Australian Communications* promised to donate $1 for every completed and returned survey to the Sudden Infant Death Association.

Since a good response rate for direct mail campaigns is generally considered to be around 2%, we are delighted to report that 451 readers completed and returned survey forms — an enormous 11% response. The staff of *Australian Communications* would like to take this opportunity to thank all those participants. A cheque for $451 has been mailed to SIDA, who will certainly be very grateful for your participation as well.

AUSTRALIAN communications

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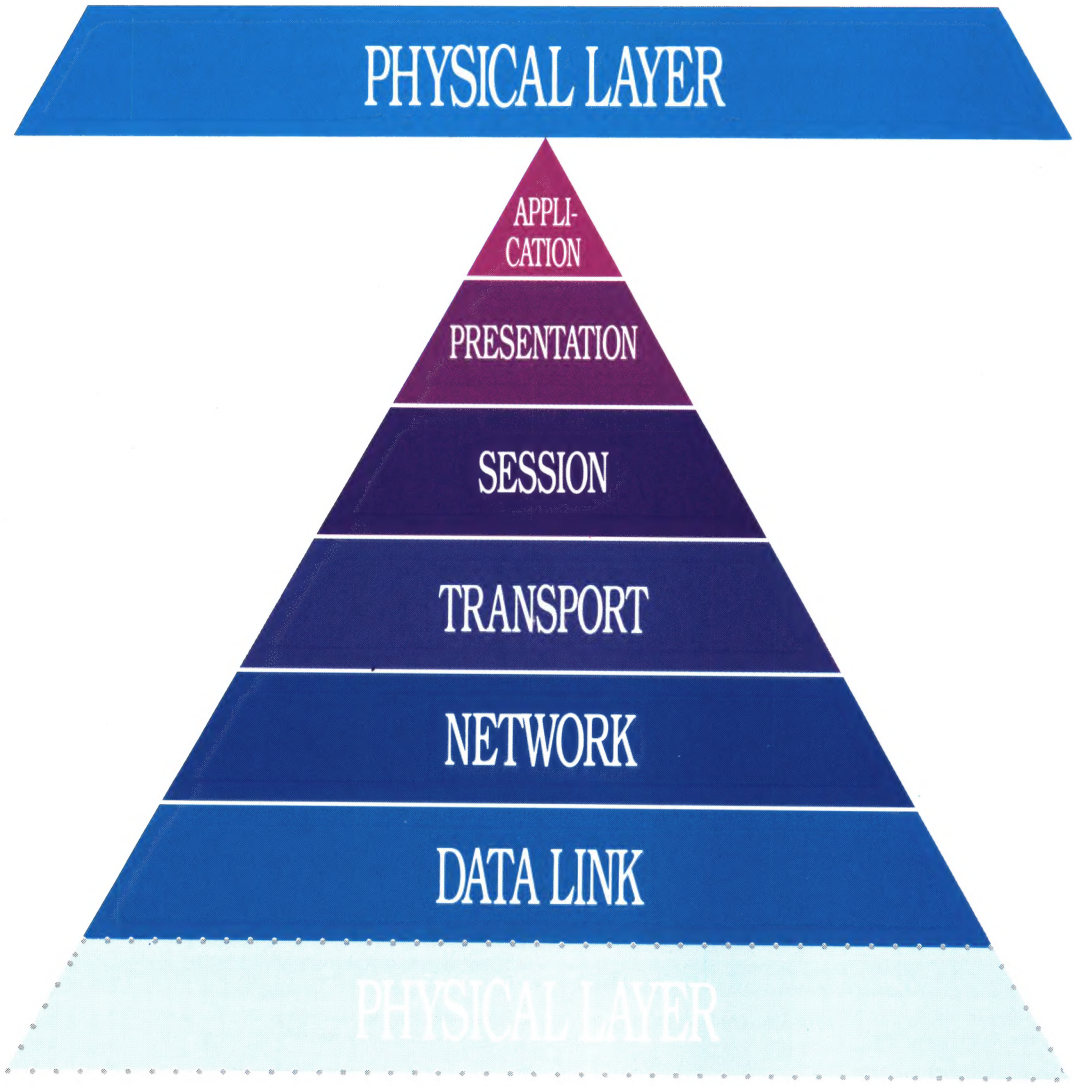

Are you making physical layer decisions a top priority?

The wiring system, or physical layer, upon which your entire communications system is built may only constitute a small portion of your investment but can cause the vast majority of your network problems. How can you be sure, with technology and industry standards changing so rapidly, that your system can run the high speed applications your business demands?

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Figure 1: Network Management

"I authorise or specify products primarily for . . . "

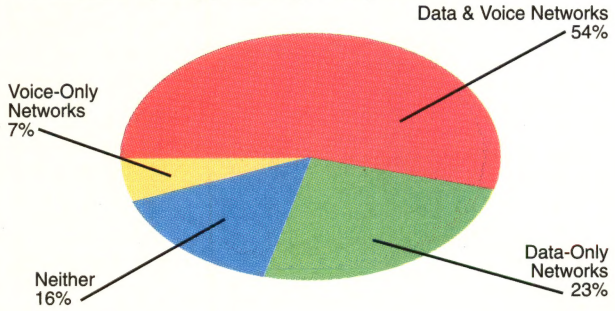


Figure 2: Company Size

"My company size is . . . "

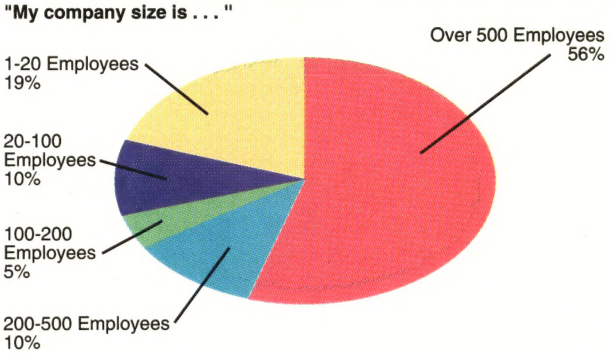


Figure 3: Network Protocols

"The following are currently in use or will be purchased for my organisation in the next 12 months . . . "

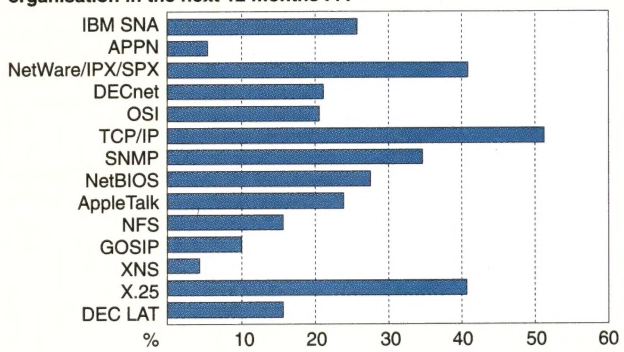


Figure 4: LAN Operating System

"The following are currently in use or will be purchased for my organisation in the next 12 months . . . "

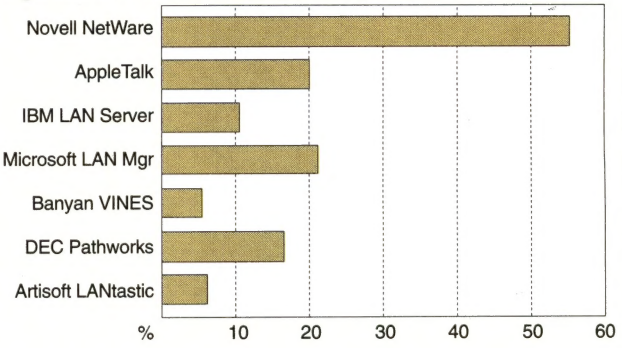


Figure 5: Operating System Environment

"The following are currently in use or will be purchased for my organisation in the next 12 months . . . "

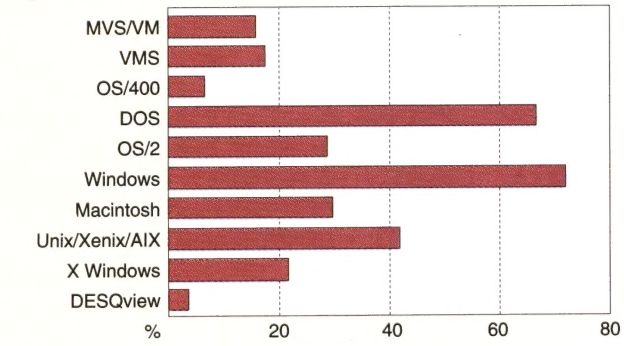
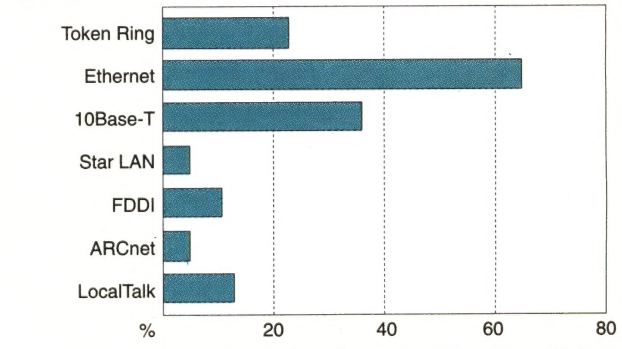


Figure 6: LAN Environment

"The following are currently in use or will be purchased for my organisation in the next 12 months . . . "



We thought it might be of interest to readers to know some of the results of the survey, which, apart from providing an overview of our readership, also pointed to some interesting trends within the communications industry.

Figure 1 clearly demonstrates the rapid convergence of the data communications and telecommunications fields. Only 7% of respondents claimed to be responsible for voice-only networks, while a huge 54% said they now manage networks which carry both voice and data traffic. Those responsible for data-only networks constituted a sizeable 23%.

Figure 2 shows that the majority — 56% — of *Australian Communications* readers work for organisations with 500 employees or more. The relatively large number — 19% — of readers working for companies of 20 staff or less probably accounts for the magazine's reach into consultancies.

The remaining four charts show the technology either currently in use or planned for purchase by readers' organisations. Novell NetWare was, as expected, by far the most popular LAN operating system in use, more than twice outstripping the next placed contender, Microsoft's LAN Manager.

The most commonly used networking protocol was TCP/IP, although IPX, SNMP and X.25 all made strong showings. Overwhelmingly it seems, users are favouring Microsoft's Windows environment, although there is still a large installed base of DOS users, and the various flavours of Unix also claimed a significant proportion of readers. While most of those who responded were running standard and 10Base-T Ethernet, the number of Token Ring users was still significant. Only small percentages of those surveyed were using other environments such as LocalTalk, ARCnet or FDDI.

The results of this survey will help us to determine the issues that are of most interest to you, our readers, and will assist us in planning our feature articles for the coming year. Once again, we extend our thanks to all those who participated. Anyone who would like to receive a copy of the complete survey results should contact Dawn Switzer on (02) 264 2200.

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Alcatel, Siemens and Ericsson FMO Winners

Alcatel, Siemens and Ericsson have emerged as the big winners following Telecom's repackaging of its network modernisation plans under the guise of its Future Mode of Operation (FMO) program. Finalised in early November, the FMO reaffirms Alcatel and Ericsson as the prime suppliers of switching equipment and names Siemens as the sole supplier of SDH transmission equipment.

Despite lobbying hard, Canada's Northern Telecom (NorTel) has failed to build on its existing relatively minor role as a niche switch supplier while existing transmission equipment suppliers NEC, Philips and Alcatel have missed out entirely on new transmission contracts.

Announcing the new FMO-guided network modernisation plan, Doug Campbell, Telecom's Group Managing Director Network and Technology, pledged that the new $3.3 billion scheme would mean an all-digital Australian network by 1998 — at least eight years sooner than the previously-held target of 2007.

In addition, adoption of the FMO will lead to a re-engineering of customer procedures to make them more efficient and responsive and the implementation of new operation support systems to help deliver world's best practice service, he said.

Mr Campbell admitted that the planned $3.3 billion expenditure did not represent additional funding over that already built into Telecom's long-range forecasts. But he claimed that Telecom will now receive much better value and more advanced technology for that money as a result of its new supplier deals. The details of those deals are still to be finalised and Alcatel and Ericsson will now battle it out for the lion's share of the new switch upgrade projects.

Initiated several months ago the early stages of the FMO study pinpointed the benefits to Telecom of rationalising its supplier base and using the resultant larger purchase orders to drive harder deals and speed network modernisation. Only existing switching and transmission suppliers were invited to bid for the new contracts.

With transmission suppliers now cut from four to one, that goal would appear to have been partly met and Mr Campbell reportedly said that NorTel would now come under increased pressure to justify its presence as the third switch supplier through superior technology.

Optus Delivering on Service

In its first mandatory customer service level report to Austel, Optus claims that it is delivering on its promise to provide customers with exceptional service and support.

The report, which Optus is required to submit under the *Telecommunications Act*, was compiled from computer data generated by Optus' customer service centres and its network operations area.

It covers the fourth quarter of the 1992-93 financial year, and shows that 98% of customers who contacted an Optus service centre with queries regarding accounts, payments, prices or general information had their queries answered immediately; that 87% of fault reports were resolved during customers' first notification to Optus; that less than 0.1% of national long distance call attempts were unsuccessful due to network errors; and that international congestion attributable to Optus' network did not exceed 1% on any day during the reporting period.

Optus' Chief Executive Officer, Bob Mansfield, said the figures in the report encouraged him to believe that the company's strong customer service approach was working. "Every aspect of our operations — our recruitment policy, our computer systems, our billing approach — is focused on serving our customers the way they want to be served," he claimed.

Telecom Names Cable Bidders

As of mid-November, 21 companies had registered to bid for Telecom's broadband network tender. With bids due to close on December 17, they were: Alcatel, AT&T, AWA, Bell IRH Industries, Bull, Ericsson, Continental Cablevision, FUBA/SAM Technology, Fujitsu, NEC, Philips, EDS, GEC Marconi, Lend Lease-Comsyst consortium, MM Cables Telecommunications, Olex Cables, Scientific Atlanta, Robert Bosch (Australia), Sagem, Siemens and Sumitomo. Industry observers expected this list to contract as the bidding companies form alliances to bolster their prospects.

The tender for the system platform reportedly includes the full range of CATV equipment, including optical and RF equipment, and network and customer management, including billing systems. It apparently will not be tied to a related ADSL pilot scheme, although the technology may find its way into any broadband system.

The bids will be evaluated over the Christmas period and a contract awarded early in 1994.

Optus Picks Up 18% Sydney Share

Austel has announced that Optus Communications has secured 18% of Sydney's telephone lines for long distance calls following the conclusion of the second Sydney preselection ballot.

Announcing the results, Austel's Chief Operating Officer, Rick Campbell, said it was important to differentiate between share of phone lines and market share. He said the two do not necessarily equate for three reasons: the percentage of traffic share is not the same as the percentage of customers; customers have the ability to select the alternate carrier on a call-by-call basis; and because people who make few long distance or international calls are most likely not to have responded, and would therefore be included in Telecom's line share figures.

The Sydney ballot had a response rate of almost 58%, which Austel described as 'very satisfying,' adding that the preselection ballot process had been 'an outstanding success.'

Intelsat Launches First VII Series Satellite

Asia-Pacific telecoms capacity will be bolstered from January 1994 after the launch of the first of Intelsat's VII series satellites from Kourou, French Guiana in late October. Intelsat has experienced capacity shortages in the region since a series VI satellite which was launched in 1990 failed to reach its correct orbit.

Part of a planned fleet of nine, the new Space Systems/Loral-built Intelsat 701 will help meet growing demand in the Asia-Pacific region. The remaining eight VII series craft will be launched between now and the end of 1995, replacing Intelsat's series V/VA satellites. They offer substantial improvements in coverage, performance and capacity. Series VII satellites can handle up to 90,000 two-way telephone circuits and three simultaneous television channels.

John Hampton, Intelsat's Executive Vice President of Operations and Services, hosted a launch ceremony in Sydney to mark the occasion.

Intelsat's John Hampton

Brigadier Neil Horn with Novell's VP Asia-Pacific, Arthur Ehrlich

DoD Signs Novell Agreement

Novell has signed a Master Licence Agreement for products and services with the Department of Defence (DoD). Under the terms of the agreement, the Department will have a 'Gold Disk' and be able to copy and implement Novell products according to usage. The Department will then audit the number of copies of each software package made, and make a once-yearly payment to Novell.

The Master Licence Agreement, which is only available to sites of over 20,000 users, is the first to be signed in Australia, and will continue after the Department's DESINE information technology contract expires on February 28, 1994.

Novell's Vice President Asia Pacific, Arthur Ehrlich, said the contract would enable the Department to streamline and manage the distribution of Novell products across its eight different Defence Programs, which between them have over 500 LANs running NetWare.

Siemens Secures Vietnam Deal

Siemens Australia has won a two-year contract worth more than $4 million to supply main distribution frame (MDF) and intermediate distribution frame (IDF) telecommunications equipment to Vietnam's Directorate General of Post and Telecommunications (DGPT).

Australian-made parts will be shipped to the DGPT, where over 150,000 MDF/IDF equipment units will be assembled locally and distributed to over 50 districts around the country.

Siemens' Export Manager, MDF, Mr Peter Pech, described the equipment as a small but significant part of the upgrading of Vietnam's telecommunications infrastructure. Vietnam has just 500,000 phones to service a population of 70 million, however, the DGPT is investing heavily in network development projects.

HP Wins Euro ATM Contract

Hewlett-Packard's (HP's) Australian Telecommunications Operation (ATO) has won a major new contract to supply test and measurement equipment to Germany's Deutsche Bundespost Telekom as part of the European pilot Broadband ISDN project.

HP Australia fought off stiff European competition to secure the deal, which is estimated to be worth over $4.5 million.

Under the terms of the agreement, Hewlett-Packard will supply modular systems of its HP 75000 Broadband test systems family to DBT, for installation in three network hubs in Berlin, Hamburg and Köln/Bonn.

HP Australia's MD, Bill Hilliard, said the ATO began looking at ATM some time ago, and was well advanced with products suited to the needs of the emerging European networks.

In Brief

Nira Australia, together with Holman Engineering, has designed an alarm monitoring system for the new Stanwell Power Station in Queensland. The system receives alarms from the existing station control system, and, in response, co-ordinates the issuing of pages through the station paging system.

Telstra has announced the opening of a Korean office. Located in Seoul, the office will assist in the provision of network services to companies with international telecommunications requirements. Korea is now Australia's fourth largest trading partner.

Apple has had to recall its Newton MessagePad handheld computers in Australia because they contain an acoustic coupler that was not Austel-approved. The recalled machines will have the device disabled before being sent out again, according to Apple.

Com Tech has announced it has joined Telecom Australia's Enhanced Distribution Channels (EDC) Program. Both organisations will now work together to offer customers a full range of end-to-end business solutions.

Pacific Star has been appointed telecommunications facilities manager for Sheraton hotels in Brisbane and the Gold Coast. Pacific Star will manage each hotel's network, including the trial installation of fax machines in guest rooms.

The 1993 ATERB Medal (Australian Telecommunications and Electronics Research Board) has been awarded to Dr Rodney Kennedy. Dr Kennedy received the award for Outstanding Young Investigator for his contributions to the field of telecommunications channel equalisation.

The ANZCAN undersea cable, which connects Australia, New Zealand and Canada, has been successfully repaired. The cable failed on June 15 after a complete cable break about 400 metres offshore from Anson Bay, Norfolk Island.

Consultel Australia, currently assessing bids for the supply and installation of the international electronic telecommunications hub for the Asia Pacific Economic Co-operation (APEC) Secretariat has expressed disappointment that none of the 11 bids now under consideration had come from Australian firms.

EDICA, the Electronic Data Interchange Council of Australia, has released a code of practice for electronic trading. Areas covered include authentication, offer and acceptance of EDI documents and their use as evidence, the maintenance of security and confidentiality, and terminations or changes to trading agreements.

Telecom's Customised Software Solutions Centre (CSSC) has been awarded Quality Certification to AS 3563 and AS 3901 by Standards Australia for software quality management and production quality assurance respectively.

Infotron Systems has announced it has completed the first stage of the LAN infrastructure for the ANZ Bank's World Headquarters in Melbourne. The contract to supply the network, which includes fibre to each floor of the bank's 30-storey building in Queen St, will be implemented in three phases.

MIM Holdings has signed contracts with a number of suppliers for the provision of the design, installation and operation of a corporate communications network. The network backbone will be provided by QNET, PABXs by Ericsson, and TIMS by Phoneware, while the design and project management will be performed by Housley Communications.

Logical Solutions has signed a five-year outsourcing contract with Optus to provide the carrier with a full range of desktop computer solutions and end-user support services.

Telecom Plus and IBM have signed an agreement which will allow the 1,500 Telecom Plus business users to connect with the 35,000 businesses using IBM's worldwide EDI network.

ATI Australia has supplied a $300,000 microwave network to the Royal Melbourne Institute of Technology, linking the tertiary education institution's three Melbourne sites.

Austrade has selected MultiTech modems from Banksia Technology to link its overseas offices. The contract to supply the modems, which was worth $80,000, was won by Design 2000.

In Brief

AT&T has announced net income for its third 1993 quarter of $US1.073 billion, or $US0.79 cents per share, up from $US963 million or $US0.72 cents per share for the same period last year. Revenues grew by just three percent to $US16.662 billion from $US16.180 billion for the same period a year ago.

Alcatel has announced that three of its subsidiaries, Alcatel SEL of Germany, Alcatel STR of Switzerland, and Alcatel Standard Electrica of Spain will provide equipment for European broadband services. Alcatel SEL has won a $12.5 million contract from Deutsche Bundespost Telekom (DBT) as part of a project to upgrade its East German network. Alcatel STR will supply DBT with a broadband ISDN test system, while Alcatel Standard Electrica will provide Spain's Telefonica with an Alcatel 1000 switch for the International Node of the European Trial Broadband Network.

Digital Equipment Corporation has reported its first quarter results for the period ending October 2, 1993. The company announced a net loss of $US83.1 million, compared with a loss of $US260 million for the same quarter last year. Total operating revenues were $US3.01 billion, down from $3.31 billion for the same quarter last year.

Hughes Aircraft Company and Japan Satellite Systems have signed a multi-million dollar deal for the construction and launch of a high-power communications satellite, to be known as JCSAT 3. The spacecraft will relay voice, data and television signals to Japan, and have multiple-beam coverage extending west to India, south to Australia and New Zealand, and east to Hawaii.

Ascom Ericsson Transmission has won a contract to supply Telecom PTT Switzerland with state-of-the-art SDH equipment. The deal is expected to have an average annual order value of around SEK270 million ($49 million) over the next ten years.

Inmarsat has announced that its Inmarsat-M digital mobile satellite communications system is now available commercially anywhere in the world. The system provides digital telephony and 2.4Kbps fax and data services via lightweight low-cost terminals. Nine land earth stations are now offering commercial service for the Pacific Ocean, Indian Ocean and Atlantic Ocean regions.

Northern Telecom (NT) has extended its Code Division Multiple Access (CDMA) licence agreement with mobile technology developer Qualcomm to include the whole world. Under the terms of the licence agreement NT can now manufacture and sell CDMA-based infrastructure equipment to world markets.

SynOptics has reported revenues of $US183.3 million for its third fiscal quarter ended October 1, 1993, representing a 70% rise over the same period in 1992. Net income was $US5.7 million but included a one-time charge for in-process R&D in connection with the acquisition of Coral Network Systems. On a pre-acquisition basis, earnings per share rose 62% to $US0.34.

Ericsson has announced it is the first company to be granted type approval for its Freeset large scale cordless PABX based on the DECT standard (Digital European Cordless Telecommunications), the European standard for cordless communications.

Deutsche Bundespost Telekom (DBT) has begun service on what it claims is the first commercially deployed fibre optic subscriber access network in the world. The network delivers telephony, optional television and data services through a Passive Optical Network for transmission over the new infrastructure.

FLAG (Fibre Optic Link Around the Globe) has announced a break with traditional cable pricing structures, and will instead ask carriers to forecast capacity and make a commensurate one-off payment. FLAG says this should reduce cable traffic, and will guarantee price protection in advance. Twelve PTTs have already signed agreements to use FLAG; they include telcos from Gibraltar, Hong Kong, India, Indonesia, Malaysia, Thailand, the United Arab Emirates, UK, Egypt and Korea.

GPT has won a contract to supply United Kingdom cable company, Southwestern Bell/Cox with a System X digital public exchange. GPT claims it is the largest order yet to be placed by a cable telephone network operator. The new exchange will cover Southwestern Bell's Midlands and north west franchises, reaching more than one million homes.

EC Drops Telecoms From GATT

The European Commission has left telecommunications out of the latest offer to open up public sector contracts to international competition, according to chief negotiator, Hugo Paemen.

The reason for the omission is that the EC thinks an imbalance would exist, because the potential European public sector telecommunications market is worth much more than the US equivalent. The EC says this in part is due to a refusal by the US to see companies like AT&T as falling within the public sector.

"We have submitted a new offer on government procurement and are withdrawing telecommunications because the US and Canada are not ready to put it in their offer," said Paemen. The EC offer was made at the Uruguay round of GATT negotiations as part of talks on expanding the procurement code.

Ericsson Signs Malaysian Deal

Ericsson has signed a contract with Malaysia's Mobikom Sdn Bhd consortium for the supply and turnkey implementation of an AMPS/D-AMPS 800MHz system. The deal is the company's third with a Malaysian operator.

The contract covers the first of three phases of the project, and is estimated to be worth over $60 million. Including all three phases over a five-year period, the value of the deal is around $183 million. The new network will become operational in early 1994, and will expand to be nationwide by early 1995.

Telecom NZ Profits Up 19.1%

Telecom Corporation of New Zealand (TCNZ) has announced a rise in profits to $NZ251.4 million for the six months ending September 30, on revenues of $NZ1.218 billion.

TCNZ reported accelerated growth in international outward calls and cellular mobile connections, and strong growth in national call volumes, access lines and cellular connections.

TCNZ Chairman, Peter Shirtcliffe, said the positive results were a reflection of the tough restructuring strategies put in place earlier this year.

Christmas Comes Early at Nokia

Festive season celebrations at Finnish telecommunications supplier Nokia have surely begun a little early this year, with the firm's recent announcement that it has won several major overseas contracts.

The first involves the supply of Thailand's first digital cellular network. Under the terms of the agreement signed with Thai operator, Total Access Communication (TAC), Nokia will supply a GSM-based DCS 1800 Personal Communications Network (PCN) covering Bangkok and the main roads to Pattaya, HuaHin and Ayutthaya. It is the company's first DCS 1800 sale outside Europe.

Nokia has also won an order worth DEM200 million ($181 million) from German digital cellular operator E-Plus for the supply of the second phase of the company's E1 PCN. The deal follows a major contract for the first phase of the E-Plus network in April this year.

Additionally, Nokia has announced the signing of agreements with Eurotel Prague and Eurotel Bratislava for expansion of their NMT 450 cellular mobile networks. The contracts are worth over DEM35 million ($31 million), with the work to take place during 1994-96.

The company has also recently celebrated the opening of a major transmission R&D facility in Melbourne. Australian MD, Pertti Melamies, said Nokia has identified Australia as a key country in its growth in the Asia Pacific region.

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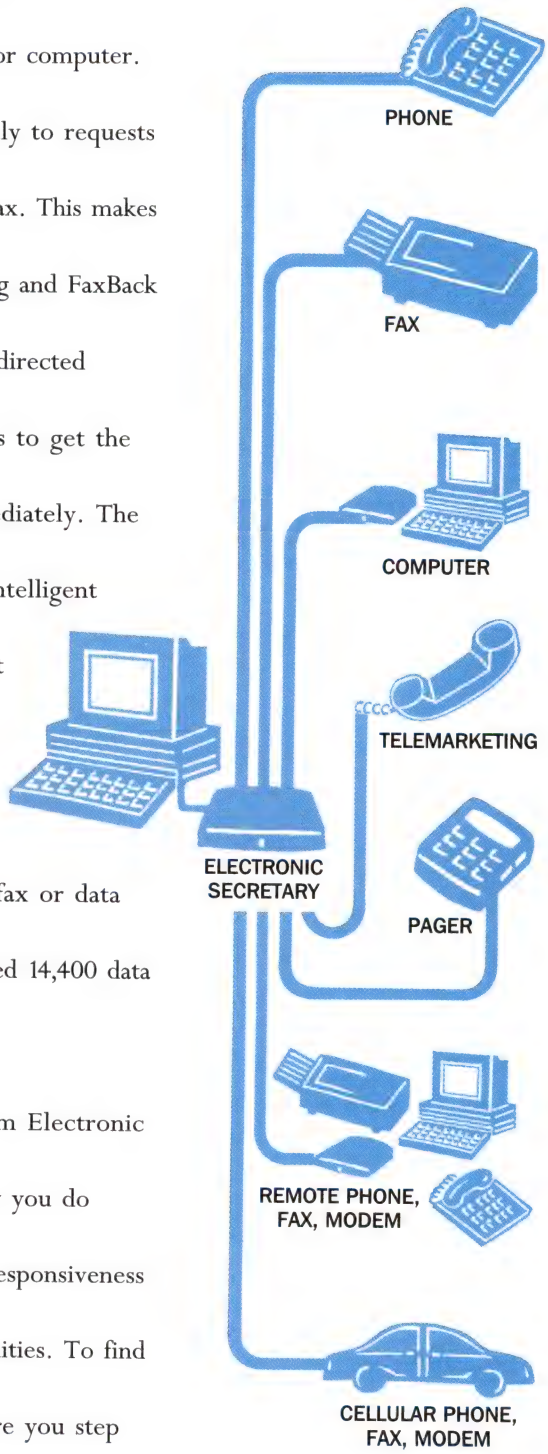

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Avoiding Interference With GSM

The SMA downplays GSM interference with hearing aids while calling for the introduction of an electromagnetic compatibility framework.

Depending on who you believe, the Spectrum Management Agency's interim report on electromagnetic interference/compatibility (EMI/EMC) is either a whitewash for GSM cellular mobile technology or a genuine attempt to bring Australia into line with emerging international electromagnetic immunity standards. The SMA position is that a generic immunity framework was always going to be necessary, GSM or not, and to its credit, it raises EMI issues which various telecommunications industry heavies have energetically tried to smother during the past year.

The report to the Minister for Communications, David Beddall, covers progress so far by a Consultative Working Group under the aegis of the Radiocommunications Consultative Council, which is examining the issue of GSM's impact on a wide range of equipment, such as hearing aids, hospital and medical electronic gear, car management systems, computers, etc. It also updates progress by a smaller Task Force and its Technical Sub-Committee, which has been specifically addressing the hearing aid interference problem, with representatives from the carriers, the manufacturers, suppliers and consumers, including hearing impaired groups such as the Deafness Forum of Australia, Better Hearing Australia and the NSW Deafness Council.

Clearly upset by media reports questioning GSM's selection and introduction to Australia, the SMA says: 'These articles were based on worst-case laboratory tests and do not reflect the real world where the signal strength can be substantially decreased by the presence of nearby objects and the body of the hearing aid wearer. Further, GSM includes a system for minimising the power used by handsets which will further decrease the potential for interference.'

But according to the President of the NSW Deafness Council, Bruce Hovey: "The inference is that the press reports were irresponsible . . . The historical sequence is that a report was issued by AHS (Australian Hearing Services) on the research they had carried out jointly with TRL (Telecom Research Laboratories) on the effects of digital GSM mobile phones on hearing aids. The report indicated that a major problem had been discovered. Most of the later press reports I saw were, in my opinion, fair comment on this matter."

Noting that over two million Australians have impaired hearing, with medical estimates that over 500,000 people will be wearing hearing aids by the year 2000, Hovey is disappointed that no-one has yet offered to subsidise those who are forced to buy replacement aids at between $900-$1,000 each.

The SMA report's assertion that the development of strong local standards will 'assist the export of locally made hearing aids to Europe,' is supported in an SMA draft discussion paper on an EMC framework for Australia. The document heavily favours adopting the European Community's 1989 EMC Directive to be introduced on January 1, 1996, and on-going standards consultations with New Zealand and other members of the Asia Pacific Economic Co-operation group. While the discussion paper addresses the extra cost to manufacturers of building in immunity and compatibility, it justifies these by saying Australian products will then be more exportable.

More than a little ironically, the discussion paper's summary recommends that, given the seemingly inevitable explosion in digital, radio-based communications systems, 'major new technologies that could raise EMC concerns should be subject to evaluation before introduction.'

But any talk of an EMC regime helping to boost exports is scoffed at by hearing aids supplier Phonak Australasia's Engineering Manager, Graham Donald: "It looks good for the politicians and bureaucrats if they talk about exports, but what they're saying is nonsense. Metal coatings and the like on hearing aids won't change a thing. Export potential has no place in this report."

"Putting in a shunt capacitor may be a partial solution for some hearing aids, but the circuitry for many models is such that this technique doesn't offer any significant improvement. The whole report is somewhat optimistic and paints a rosier picture than is really the case." Donald said an even bigger problem was that hearing aid customers wanted flesh-coloured devices and the appearance of metal specks ruined the cosmetic appearance of the product.

However, Bruce Macaulay, the Senior Design Engineer with award-winning Australian company Cochlear, said his company was prepared to accept the added cost of immunity. "We have to meet many local and

GSM and the Pitfalls of Regulating Technology

Ericsson, the major supplier of GSM technology for Australian networks and an industry leader with 40% of the world's mobile telephone market is now admitting that GSM is not all it's cracked up to be. Similar views are also being expressed by Telecom, operator of the only analogue AMPS network.

Colin O'Reilly, Ericsson Australia's Director of Mobile Communications, announcing a $83 million order for GSM network equipment from Telecom said "Digital voice is very different to analogue, sometimes the speaker sounds fuzzy or hazy, like they've got a cold." Describing GSM as "40 to 50 times more complicated than analogue," he said "there's a lot of fine tuning of the network equipment, it's not easy."

Kevin Philips, Telecom's National Manager, Mobile Networks, expressed a similar view, saying that the distorting effects of digitisation were particularly noticeable on higher pitched women's and children's voices, and both said that there were problems with call dropouts, with noises like 'breaking glass' caused by muting algorithms which come into play when too many bits of the digital signal are lost, and with clipping of speech.

O'Reilly said he was confident that service would improve as operators gained more experience with GSM and as the technology was refined. Some of these improvements would be available to users of current GSM handsets, he said, and further improvements would come from improved handset design.

Philips was more specific. He said that, in Australia, within six months GSM and AMPS services would be on a par, and after that GSM would be ahead.

He may be right but, after many promises of the superiority of GSM, these problems are only now being acknowledged. The admissions come at a time of record growth in the analogue network and they cast doubts on whether the Government will be able to stick to its plan to close analogue down with the end of the millennium on January 1, 2000.

Philips said that the analogue network (Telecom and Optus combined) grew by 37,300 users in October. It now stands at over 830,000. To provide adequate capacity Telecom will spend over $200 million in the current financial year alone on network infrastructure. Yet from January 1, 1995 the AMPS-B band becomes a secondary allocation, which means frequencies would have to take second priority to other, primary allocations such as fixed links.

According to Philips, Telecom is committed to maintaining the current level of performance of the network. So unless subscriber numbers do fall away as predicted Telecom will be unable to progressively release spectrum as first planned.

Neither Telecom or DOTAC anticipated anywhere near the level of popularity of cellular telephony when the band plan was drawn up. The prediction was for analogue to have already peaked at 520,000 users. The current expectation is about 1.1 million sometime next year. But every prediction made so far for the growth of cellular has been way below reality.

Mobile communications continues to gain acceptance in more and more segments of the community. Philips argues that dealer and carrier marketing strategies will gradually tip the balance in favour of GSM — for example, Vodafone is already selling GSM phones heavily subsidised at less than $1,000.

However, any migration to digital will create a ready, and uncontrollable, supply of cheap secondhand analogue handsets. Telecom may be able to raise analogue tariffs and cancel some of the low usage FlexiPlans which make mobile phones attractive to the casual user, but there seems to be an increasing likelihood that, as the 20th century draws to a close, many thousands of Australians will be protesting mightily at the impending legislated obsolescence of their 20th century technology.

The recent closure of the 007 pre-cellular mobile service provides a salutory lesson. In functionality it was far below cellular. In cost it was higher. Yet users hung on to the bitter end, the last was cut off in mid-conversation when the plug was finally pulled.

The government may well find itself caught between the devil of a dissatisfied electorate and the deep blue sea of Vodafone, which paid $140 million for the third cellular licence on the understanding that it would not have to compete with analogue after 2000.

Stuart Corner is the Editor of Exchange.

international standards, so we see this as just another one to deal with," MacAulay said. "It's a pragmatic decision: GSM is here to stay, but it shouldn't have created the interference problems in the first place and they should have been spotted much earlier. Hearing aids have a lifespan of about four years, and because GSM sales have been slow, by the time it becomes universal, the old hearing aids will have been phased out."

Macaulay added that Cochlear, with help from Optus, had done its own research on seven ear implantees which showed that a 2-watt GSM handset needed to be a metre or closer and an 8-watt GSM transportable within three metres for any interference to occur.

The SMA report says that any EMI/EMC problems will be referred to the government department responsible for the regulation of the affected equipment. For example, hearing aids and medical equipment problems will be referred to the Department of Health, Housing, Local Government and Community Services.

But a senior communications engineer with one of the big four Australian banks said the SMA was "buck-passing" and had focused its attention on future equipment and not the hundreds of thousands of vulnerable electronic devices already in the market. "They speak about adopting the European Community standards for 1996, but it's basically tough luck for all existing gear and there's bugger all we can do about our thousands of credit authorisation terminals," he said. "Fortunately, GSM is simply not taking off, though I understand Optus has been pushing it with the board of this bank and others."

The SMA's job is not helped by international reports that GSM handsets can force carrier loss on modems and standard faxes at 12 metres; that they are hazardous for internal office personal computers and PABX-connected telephones. One report from New Zealand suggests GSM gives crisp, clear reception in the open, but in low coverage areas, produces a 'banjo' effect like the sound-track of a sci-fi movie. Also, that apart from Germany and Portugal, GSM penetration in the 20 countries where it has been introduced has been sluggish at best.

Radio communications consultant, Neil Boucher, who openly attacks GSM and members of the GSM MoU group, said: "Simply put, GSM is only viable where there is no competition." Boucher said that adding to the woes of time division multiple access (TDMA) technology upon which GSM is based, the eighth largest carrier in the US, Ameritech, has dropped plans for digital TDMA implementation after a study concluded that the digital alternative is inferior to the existing analogue system.

Meanwhile, the SMA's Acting Manager, EMI Side Effects, Cliff Law, says the Consultative Working Group and the Task Force will continue their discussions and research, with more community forums and consultations in December and January before recommendations are made to Communications Minister, David Beddall, in late January or early February.

Bernard Levy

Paging

Matrix Comes Home

The imminent re-entry of paging and messaging entrepreneur, Gabby Lorentz, under the banner of Matrix Communications, into the Australian market contains some interesting pointers to Australia's value as a research and development centre, but its relative insignificance as a customer base in the Asia-Pacific telecoms market.

With many Asian economies experiencing phenomenal growth rates, driven by poorly-serviced populations numbering in the hundreds of millions, Australia's telecommunications customer base, for all its sophistication, looks like small beer.

Lorentz, Matrix's Chairman, appears to be re-entering the Australian scene far stronger than he left, having laid the foundations for one of the largest alpha-numeric paging networks in the world, EasyCall, which now covers Indonesia, The Philippines, Thailand, Malaysia and has strong prospects of cracking mega-markets, India and China.

Lorentz ceased commercial paging activities in Australia in 1988 under constraint of trade arrangements after selling the VoiceCall network, with 25,000 subscribers, to Link Telecommunications, a subsidiary of BellSouth, for $30 million. He then launched Matrix as an offshore operating vehicle selling the EasyCall paging and messaging service. Link is currently the Australian market leader, with around 37%, ahead of Telecom Paging with around 34% and Hutchison with the balance.

Now the commercial exile is over, Matrix Communications is eyeing the Australian market and busily developing more sophisticated paging software in a NSW-based joint venture with Telstra, named Telecom Messagetech. While Lorentz refuses to divulge details of Matrix's Australian plans, a launch can be expected by February or March next year based on 'unique' services and lower tariffs.

Asian Success

In The Philippines, Matrix's local joint venture, EasyCall Communications Philippines Inc., is now a listed company and the largest local paging operation with 60,000 subscribers. In Malaysia, where there are up to 40 paging companies in a relatively small market, the local Matrix operation, Telesistem, has 20,000 users. EasyCall Thailand, whose rivals consist of Hutchison, Pacific Telesys and Phonelink, a joint operation between M-Tel and Singapore Telecom, has 80,000 subscribers.

In Indonesia, the latest country to be signed up, the local operator, PT Telematrixindo has targeted over 50,000 subscribers over the next few years, offering 11 kinds of 24-hour services linking five cities, with plans to cover another 15 cities. While there are some 40 paging companies in Indonesia, Telematrixindo is the only one to have secured a national licence, beating Hutchison and Motorola.

In India, Matrix is among the 16 companies that have tendered for some of the 27 paging licences to be issued for the sub-continent's major cities. In late October, Matrix also negotiated a Memorandum of Understanding with companies associated with the Beijing Government for 108 paging centres to be established around the PRC.

"With India's population at 900 million and China's over a billion, if these negotiations become actualities, then EasyCall will reach over half the world's population," Lorentz said.

But he refused to put a money value on the total operation saying: "While building, you don't make a profit for the first two-to-three years. As long as we keep setting up networks, we will incur losses, but those networks will increase substantially in value over time. Our operation in the Philippines, for example, has gone from a zero dollar value to now being worth over $US50 million."

Lorentz, a lawyer by profession, defines his chief role as financial negotiator for all the EasyCall/Matrix operations in his role as Chairman of Matrix Asia and Matrix Australia. He is also a Director of some of the Asian operations. Matrix's share listing includes some Asian heavyweights, such as ABC Communications in Hong Kong, headed by Sir George Ho, who also has stakes in Hong Kong Broadcasting and Jardine Matheson. In Australia, investors include the FAI group, Mercantile Mutual and Sun Alliance.

Lorentz sees Matrix's major strength in its software R&D efforts. "The big difference between us and our rivals is that they use off-the-shelf products, so to some degree, they are 'me too' companies. We have our own proprietary software which is adapted to the latest hardware from companies such as AT&T, so we can provide unique services the others can't," Lorentz said.

While he concedes that the relatively small Australian market is already somewhat crowded, Lorentz says "there's always room to do it better and cheaper. We estimate we can do it profitably by offering services which are more closely tailored to the general public, and to the small business and corporate markets. This would involve a kind of Flexi-Plan approach to billing."

Based on his experience with VoiceCall, founded in 1983, Lorentz concedes Matrix will have its work cut out building a sizeable customer base in Australia, compared to Asia: "Building up VoiceCall to 25,000 users took a lot of hard work over five years. Compare that with Thailand, where our rates are comparable and we grew to 75,000 subscribers in just nine months."

Bernard Levy

Competition

Where are Optus' Business Services?

In the July issue of its *Newsbrief*, ATUG published a list of those telecommunications services in which it judged competition to exist alongside a list of those in which it judged there to be no competition. The competition list numbered 12 services, the non-competition list 41. ATUG was trying to prove a point: 'Telecom has a continuing monopoly in most service categories . . . For half the population of Australia competition is something they read about in newspapers.'

ATUG's assessment was not entirely accurate (it listed EDI as a monopoly service) and where strictly accurate not necessarily meaningful. Monopoly services included 007 mobile, now phased out; teletex, now almost dead; and telex, where user numbers were declining by 25% annually the last time Telecom published such information.

Nevertheless, the analysis raises an important question. What has Optus done for business users of communications services, except give them a choice of operator for long distance and international calls and brought about price reductions for those services? Business users need a whole raft of other services, and the promise of the reforms of recent years was that competition in these services would appear as a natural consequence of introducing the second carrier and permitting unrestricted resale.

So how well has our second carrier fared on this score? Optus made its first foray into the specialist business communications market in January this year when it announced a package of leased international services under the name Optus Interlink. The package comprises:

- Optus Lightlink, a premium quality service for businesses requiring 'instantaneous' two way transmission of data (for example, an Australian business constantly interacting with computers overseas);
- Satlink, which uses Pacific Ocean, Indian Ocean and Tasman satellites to offer economical transmission services for those businesses which do not require rapid 'back and forth' transmissions; and
- Splitlink, for users to route diversity by sharing their international traffic between satellite and fibre optic routes.

Optus said that Interlink services would cover the major world business regions, including New Zealand, Singapore, Hong Kong, Japan, North America and the UK. 'Each region will come on line at a different time throughout 1993 as connection agreements and tests are completed.' Optus said it would file the tariff for the new business services early in 1993. However

the latest revision (October 1993) of Optus' Basic Carriage Service Tariff only contains details of Lightlink.

Lightlink, which competes with Telecom's Lightstream service, is an international leased service on optical fibre submarine cables. Lightstream guarantees performance levels. Optus says these will be available on Lightlink 'in conjunction with each corresponding carrier once sufficient performance statistics for each route are established.' Lightlink is at present available in New Zealand, Hong Kong, Japan, Singapore, and the US.

A key component of Optus' strategy to serve business customers was its plan to install optical fibre loops in the central business districts of major cities and in other business centres such as North Sydney.

It was able to accelerate plans to do this by signing agreements with electricity bodies in Melbourne, Sydney and Adelaide to use their ducts. It completed the first optical CBD loop in April, in Sydney and now has facilities in North Sydney, Melbourne's CBD and St Kilda Road, and Canberra's Civic Centre and Parliamentary triangle. Rings are planned for Brisbane, Adelaide, and Chatswood, a northern suburb of Sydney. Optus also envisages business clusters in an additional 20 locations — in Sydney at Bondi Junction, Frenchs Forest, Hurstville, North Ryde, Epping, Crows Nest, Parramatta, Pymble and Rydalmere, and in Canberra at Bruce, Belconnen, Fyshwick, Mitchell, Tuggeranong and Woden.

Optus now offers an end-to-end domestic leased line service at speeds from 48-Kbps to 2Mbps, known as Optus Datalink. It will use Optus' fibre loops and fibre customer spurs where available, and digital microwave links elsewhere. It is only available now in Sydney, Melbourne and Canberra at present, but is scheduled to be extended to Brisbane, Adelaide and Perth by the end of the year.

Optus' selection of NorTel as its main switching supplier is well known. Perhaps less well known is its decision to buy two switches from US specialist manufacturer DSC. These are specifically designed to support intelligent network (IN) services such as toll free and credit card calling.

Optus' first IN service, the Optus Calling Card, was launched in August. The card is similar to Telecom's Telecard, and allows customers to make local, long distance and international calls from standard telephones and payphones and bill the call to their Optus account. The card can also be used to call Australia from Canada, Germany, Hong Kong, New Zealand, the UK and the US, whereas Telecom's Telecard offers access from over 30 countries. Additionally, Telecom has also signed an exclusive agreement to offer Visa's new Visaphone service.

Optus allows customers to restrict use of its card to five numbers or to only international or national calls. The service also allows two-digit abbreviations for up to five frequently called numbers. These facilities are not available on Telecard at present.

Optus has also opened a facilities management centre at its main Sydney exchange in which business customers can house their own telecommunications equipment. Optus offers to provide proprietary network management for several well-known brands of networking equipment.

That's the achievement to date. There are a number of satellite-based services, but these are largely inherited from Aussat. But what about all the other services that businesses clamour for: ISDN, virtual private networking, direct indial, centrex and so on. They are still in the works apparently (see Liz Fell's interview with Optus CEO, Bob Mansfield, starting on page 55), and are described in the company's glossy brochure as 'planned' or 'will offer.' ATUG was correct — full competition is still not with us.

Stuart Corner is the Editor of Exchange.

Australian Industry

INC Eyes Asian Markets

Armed with new investment funds and distribution deals with large US suppliers, Australian network products manufacturer and distributor, INC Communications, is poised to expand its operations locally and into South East Asian markets.

INC's founder and Managing Director, Moni Livne, revealed in October an equity shareholder agreement with specialist development capital company, Hambro-Grantham Management. For $1.2 million, Hambro-Grantham has secured 30% of INC — a good deal for the investment company, according to Livne. "We didn't have any debts, borrowings or leases and we already had something like $840,000 worth of stock in hand for a total company valuation of around $3.6 million," he said.

Livne said he planned to spend some $600,000 of the Hambro-Grantham funds on more sales staff as well as stocks from US suppliers, Retix and Chipcom International, with which INC has signed Australian distribution deals. Another $600,000 will go towards establishing offices in Singapore and Hong Kong.

With some 35 staff — about half involved in manufacturing at INC's plant at Blaxland in the Blue Mountains near Sydney and the remainder involved in administration and sales mainly out of Sydney — INC boasts that it is the only one-stop shop for Token Ring, Ethernet and AS400 Multi-Station Access Units (MAUs) and connectors in Australia, with a range of 40 products. "Our rivals, like SynOptics, Cabletron, and Proteon supply only one or two of these product types, not the full range," he said.

But these companies say INC is positioned for the mid-to-low end of the market and is thus not a major threat. "There are 96 hub vendors in Australia, 42 of them transnationals, and what SynOptics tries to do, with 35% of the market and 250,000 installed nodes, is work at the high-volume, strategic end with the oil companies, the banks, government departments, etc. INC is really working at a smaller, tactical level," said SynOptics' Australasian General Manager, Steve Wood.

According to Livne, INC is attempting to secure greater market share by "doing things differently" and building as much local content as possible into its products — up to 65% on many items.

Livne, an Israeli who arrived in Australia as a business immigrant from Hong Kong six years ago, started up locally by buying the computer installation company, ACE.

"ACE was in a bad financial position and I turned it around by securing some exclusive contracts," Livne said. In June, 1991, he started up an off-shoot, INC Manufacturing and by November of that year, had completed the Blaxland factory for around $250,000, and was shipping the first locally-made products the next month.

"INC Manufacturing came from having zero revenues to $2.5 million by December, 1992," Livne said. "Our target for the end of this financial year, June 30, 1994, is for turnover of $7-8 million for the whole group. ACE is expected to contribute $2.5 million, and the rest will come from INC's manufacturing and sales operations."

INC's sales should be solidly boosted by the Retix and Chipcom deals, Livne says, emphasising that part of the secret of INC's success has been to draw on a wide range of international contacts and to have access to new technologies from Asia, Europe and the US. "Apart from Retix and Chipcom, we have access to all sorts of other ventures around the world, big and small," Livne said. "In Israel, I invited business people to visit Australia. That resulted in a manufacturing deal with Lannet, the big Israeli local area network company which is now listed on the US stock exchange."

Under the deal with Chipcom, INC will be the sole Australian distributor of products including high-end, intelligent switching hubs, allowing the local company to target larger, more sophisticated networks. The OEM deal with Retix will see INC selling the American giant's bridge/router range. "Their products complement ours and since the agreement was finalised, we've already sold over $300,000 worth of Retix units," Livne said.

Bernard Levy

United States

Carriers Split Over PCS Licences

While the US FCC's recent decision to clear the way for the deployment of Personal Communications Services (PCSs) has at last opened up what some estimate will be a $US40 billion p.a. market within 10 years, the details of its ruling have left many would-be players disgruntled.

In May of next year, the FCC and the US Government are hoping to raise more than $US10 billion by selling off licences in the allocated 160MHz PCS spectrum. The licences that will allow carriers to have the best chance to be successful will also cost the most. The FCC will sell two 30MHz licences for each of 51 MTAs (major trading areas) and a 20MHz and 10MHz licence to be reserved for small business and rural telephone companies. Thirdly, the FCC will auction off three small licences covering 10-MHz in each of the 492 'basic trading areas.'

In order for a carrier to set up a nationwide service, the company has to submit a sealed bid that combines every MTA licence into one big offer. If that bid is more than the combined total of the top bids for all other MTA licences, the nationwide bid would win a licence in each region. And having the money to acquire a licence in every region is not the only prerequisite: the FCC will also require that the company winning any licence must make its PCS service available to one-third of all potential customers within five years and two thirds of all customers within seven years.

"We are disappointed that the FCC did not listen to our arguments about the nationwide licence benefits and has made it a lot more difficult to set one up," said Steve Zecola, VP of PCS for MCI. "But nonetheless we believe that PCS is going to be a huge market in 10 years and is something that we are going to be a major player in. We are prepared to spend a lot to get a lot."

If MCI's bid falls through, Zecola said that the company is planning to head up a consortium of other carriers to provide ubquitous service around the US.

While MCI was disappointed with the FCC decision, AT&T was glad that no national licence was established because it felt that it would limit the amount of competition. According to Bill Weiss, a spokesman for AT&T, the company will look to resell or form joint ventures with other PCS providers to set up a ubiquitous service.

"The idea of a national licence to be provided by one carrier would have greatly hurt the chances for smaller carriers to compete," said Weiss. "This way there will be no one dominant carrier for PCS; it will force everyone to work in conjunction to provide a comprehensive service. "

The FCC decision was also not well received by cellular carriers who were told that they could only bid on the 10MHz licence in the basic trading areas in regions where they already offer cellular services.

"We feel that we were penalized by the FCC for being in the cellular business," said Tom Dougherty, chief strategist for BellSouth Cellular. "By only allowing us access to such a small portion of the spectrum in areas that we already have an infrastructure set up is a very poor allocation of resources that are already there."

To counter the FCC decision, BellSouth is going to upgrade its service and combine it to work with PCS. To remain competitive against larger PCS providers, "We are going to have to dump a lot of money into the cellular end of our business to convince users to stay with cellular," he said.

Mike Moeller

France

France Telecom Slowly Opens Up to Competition

Over the years, France Telecom has won an international reputation for pioneering new public network technologies, and its impressive list of early implementations includes digital switching, national X.25 packet service, national videotex, and ISDN.

But the French PTT has had some significant help getting *en tête*: its monopoly hold on the market has let it pick and choose the technologies it wants to invest in. And since it faces virtually no competition, the PTT doesn't have to worry about protecting its flank before forging ahead into new territories. Now, it looks as if this golden age of protectionism is drawing to a close — and there are plenty of alternative carriers and service providers in other countries who think the change is long overdue.

The Commission of the European Communities (CEC) decreed that telecommunications data services all across Europe must be open to competition by 1993, and the French Government — after arguing long and hard — is going along with the policy, albeit grudgingly.

Some progress has already been made: restrictions have been relaxed on providers of two-way VSAT (very small aperture terminal) satellite services, opening the door to the possibility of bypassing France Telecom for some data services. International providers of value-added networks (VANs) are now allowed to operate virtual private data networks in France. But VSAT and VAN providers have yet to set up networks with geographic coverage that can come close to matching that of France Telecom.

Still, this is a start (however slow). The real test will be in the coming months, as those in favour of liberating French telecommunications clash with a government that seems intent on following the letter, rather than the spirit, of the law.

Those backing deregulation argue that as a monopoly provider France Telecom has been able to create user demand for new services by stacking prices in favour of those services. Artificially low prices have kept corporate users on the national X.25 network, while inordinately high charges for leased lines have dissuaded them from building private networks. A recent round of price changes has lowered the cost of digital leased lines to some degree, but private networks remain out of reach for many businesses. By maintaining severe restrictions on alternative carriers and services, the French Government has ensured the national carrier's success.

The biggest losers to date have been corporations that have no choice but to build private networks to meet special communication requirements. Despite loud complaints from these users, efforts to introduce service options through competition have been limited. Whether that will change — and to what degree — remains to be seen.

Unfortunately, all indications are that the rightist government plans to continue efforts to preserve France Telecom's monopoly at home while building presence as a global carrier. The PTT is being privatised in the hope of forging a strong alliance (through a stock swap) with Germany's Deutsche Bundespost Telekom.

If there's any consolation for users, it's that the carrier expects to continue its pioneering role in rolling out public services. Forthcoming offerings likely will target corporate customers specifically. Foremost among the anticipated new services is an ATM (asynchronous transfer mode) virtual path service that provides point-to-point connections. Also in the works is a Connectionless Broadband Data Service (CBDS) that will offer LAN and PABX interconnect services over virtual private networks. Pilot versions of both services are scheduled to go into operation late next year; France Telecom demonstrated its ATM and CBDS technology at October's Interop 93 Europe show in Paris.

The New Resistance

So far the French Government has shown a marked tenacity in resisting efforts by the Commission of the European Communities to open telecommunications services to competition. It challenged the right of the CEC to issue its services directive, which forces member states to allow competition among providers of data services. After losing the legal battle in the European Court of Justice, the French Government implemented the directive in such a way that it came into force at the last possible moment — January 1, 1993. It also set up a long-winded bureaucratic procedure for issuing licences. So far, only one operator has actually received a licence to offer public data services: Transpac SA, the France Telecom subsidiary that runs the nation's public X.25 network.

The way France Telecom sets service prices has had a clear impact on usage patterns. Like its German PTT neighbour, France Telecom has promoted packet switching as the service of choice for data services; in France's case, this promotion comes in the form of low prices, especially when compared with the outrageous charges levied for leased lines. The cost difference between X.25 and leased lines has kept French corporate users tied to Transpac's national X.25 network. On average, French X.25 prices are nearly half those in the UK and Germany, according to data supplied by the Organisation for Economic Cooperation and Development in Paris.

The French carrier's leased-line prices are particularly high for digital circuits. France Telecom charges about $900 per month for a ten kilometre, 64Kbps digital line; a similar line costs about $555 per month in the UK. The price difference is even more dramatic for longer circuits: a 200km 64Kbps digital line costs $3,222 in France and less than $900 in the UK. Costs for 1Mbps lines also are three to four times higher in France than in the UK. However, on transatlantic routes France Telecom has one of the lowest rates in Europe — reflecting the carrier's interest in boosting its stock as an international service provider.

Good News, Worse News

Efforts by France Telecom to address imbalances in its leased-line charges have brought decidedly mixed results so far. Early this year, the carrier cut its rates for digital circuits, slashing charges for some long-distance lines by as much as 50%.

That's the good news. The bad news is that the digital price cuts were accompanied by increased charges for short haul analogue leased lines. And since most leased-line customers use analogue lines rather than digital, the cost of private networks has gone up in most cases.

France Telecom says that the analogue leased-line price hike reflects its effort to eliminate price subsidies for certain services. "Short-distance analogue circuits have been more heavily subsidised than others," says Jean-Pierre Temime, France Telecom's Manager of professional telecommunications services. "When you take subsidies away, prices go up."

But the high cost of leased lines is stunting the growth of LAN internetworks in France. Internetworking gear like routers and bridges don't perform well when used with X.25 networks. To help correct this problem, Transpac now offers a LAN interconnect service over its X.25 network, providing point-to-point links at speeds up to 2Mbps. The service is based on the use of terminal adaptors with frame relay and other interfaces that are better suited for carrying traffic from routers. Transpac announced this LAN interconnect service in 1991, but it has attracted only about 200 customers so far. The service provider says delays in equipment development have slowed demand for the service.

The arrival of competing data services is boosting prospects for internetworking. Several operators of international VANs are expanding their networks in France. These operators don't need a licence to provide services if they limit their offerings to virtual private data networks for closed user groups, such as individual companies.

The international VAN that's been most aggressively pursuing users in France is

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BT, via its BT France subsidiary. BT France is constructing a national X.25 network in France as part of a global expansion of its Tymnet/Global Network Service. BT France already has installed 20 points of presence (POPs) in major French cities and plans to extend its French network to 100 POPs. The operator has reportedly already signed up over 100 corporate customers in France.

Other international VANs expanding in France include IBM Information Network and UK firm Scitor. The latter recently signed up major French bank Credit Lyonnais as a client — a significant contract given the tendency of French banks to stay with national service providers.

A Glimmer of Light

The emergence of VSAT service providers throughout Europe offers another ray of hope for private networkers in France. Earlier this year, a number of European governments — including the French government — agreed to relax restrictions on operators of VSAT satellite services. More than a dozen operators, many of them foreign, have already secured licences to offer two-way services in France. Licence holders include BT France, Alpha Lyracom (also known as PanAmSat), MCI and Dutch firm Unisource Satellite Services B.V.

BT France says it plans to install a VSAT hub in Paris, while MCI is already bypassing the French carrier; it recently installed a pan-European VSAT network for Holiday Inn Worldwide, including locations in France.

For its part, France Telecom hasn't been slow in cashing in on equivalent liberalisation in other countries. In addition to hubbing VSAT services out of France, it has set up a VSAT subsidiary in the UK, called Maxat. Maxat is collaborating with the UK subsidiary of Hughes Network Systems to offer two-way VSAT networks, in direct competition with BT. Maxat says it has a number of orders in the pipeline from UK customers. France Telecom says it is planning a similar project in Germany.

On the international X.25 front, Transpac is working toward setting up a 'pan-national' X.25 network, according to Gerard Simonet, Transpac's Director General. In the UK, France Telecom Network Services, a joint venture of Transpac and sister subsidiary France Cable et Radio, has purchased a number of private X.25 nets and is integrating them into a national service. In Germany, Transpac has bought a controlling interest in Info AG, a national VAN provider. Transpac has similar projects in Italy, Sweden, and Switzerland, giving it about 300 POPs outside France. The carrier hopes to extend its global reach eastward as well, and is collaborating with Romania's PTT to develop a national data service.

Simonet sees Transpac's approach as enabling the provider to compete against national operators in each country as well as meeting requirements for international coverage. He sees a different role for Infonet Services, the international VAN operator which is partly owned by France Telecom — as the provider of international networks which connect a handful of sites in each country.

The stepped-up activity on the international scene — particularly the moves targeting British users — clearly is a reaction to the alliance struck earlier this year between BT and MCI. The deal, in which the British carrier is buying 20% of MCI's stock, enables the two companies to join forces to offer multinationals virtual private networks carrying voice and data.The development is seen as a milestone in the transformation of the marketplace for international telecommunications — a transformation that will result in a few global carriers competing fiercely with one another, stealing corporate customers from national carriers in the process.

The BT-MCI merger was "a blow to France Telecom," admits Gerard Longuet, the French PTT Minister. France Telecom and Deutsche Bundespost Telekom also had been in final negotiations with MCI over its entry into the Eunetcom alliance — a deal that died with the merger.

In the aftermath of the BT-MCI deal, Longuet commissioned a review of France Telecom's strategy. The recommendation which came from that review: privatise the national carrier so that its shares could be sold, notably to foreign PTTs like Germany's DBT. Privatisation plans are being incorporated in a draft telecommunications law that is soon to be debated in the French parliament.

Uphill Battle

Whether or not France Telecom forms alliances with foreign PTTs, it faces an uphill battle winning back the trust of users that have had trouble getting international digital circuits from the carrier in the past.

Nevertheless, the organisation has made improvements in recent years. In addition to reducing transatlantic charges, it has gone a long way toward making its lines more reliable. A service called Quality Plus, launched earlier this year, guarantees minimum monthly availability rates (uptime as a percentage of total time) on cross-border digital leased lines. The guarantees apply end-to-end, which means they include the part of the circuit not supplied by France Telecom. A minimum 99.7% availability is guaranteed for lines to countries with well-developed networks, including North America, Western Europe (minus Spain and Italy), and some Asian countries. A lower minimum rate of 99.2% is guaranteed for other countries. Under the scheme, France Telecom refunds up to 15% of a customer's bill if the guarantees aren't met.

Annie-Marie Roussel

10Base-F Stretches Ethernets

A new IEEE premises wiring standard boosts the maximum distance an Ethernet signal can travel over fibre optic cabling.

For organisations that need to expand their building or campus-wide Ethernet fibre backbones beyond the restrictive confines of earlier wiring standards, the IEEE's new 10Base-F suite may be just what the networking chiropractor ordered.

The 10Base-F specifications, formally approved in September by the IEEE as an 802.3 standard for premises wiring, enable network planners to stretch Ethernet fibre backbones to a maximum distance of more than four kilometres without the use of bridges or routers. The fibre optic interrepeater link (FOIRL) standard that 10Base-F replaces limits backbone distances to a maximum of about 2.5km — making it unsuitable for many campus-wide Ethernets. The new standard also doubles FOIRL's 1km limit on cable runs between hubs or signal repeaters, which means 10Base-F wiring schemes are less likely to require repeaters.

The three wiring specs that make up 10Base-F — known as 10Base-FL (for fibre link), 10Base-FB (fibre backbone), and 10Base-FP (fibre passive) — give planners a much wider range of options for extending existing Ethernet installations or planning new ones. For instance, the new standard makes it easier to create collapsed backbones to interconnect workgroup LANs.

Along with making Ethernet backbones stronger and longer, 10Base-F gives users a standard way to handle fibre connections to the desktop — a critical consideration given the anticipated growth in video and multimedia applications.

On the way to creating a new standard for Ethernet fibre optic cabling, the IEEE's 10Base-F committee came up with a revised set of systems design rules for all 802.3 LANs. The IEEE previously had published a loose set of guidelines specifying acceptable topologies, distances, and the like for Ethernet networks. The new design rules offer an easy way to figure out acceptable configurations for networks constructed with all types of media, including thick and thin coaxial cabling and copper wiring as well as fibre.

Although 10Base-F's approval hasn't yet garnered any major headlines, vendors of premises wiring equipment are keenly aware of the standard. At least one 10Base-FL chip set is now on the market, and several hub vendors have already announced plans to fit the standard into their new product lines.

Coming Up Short

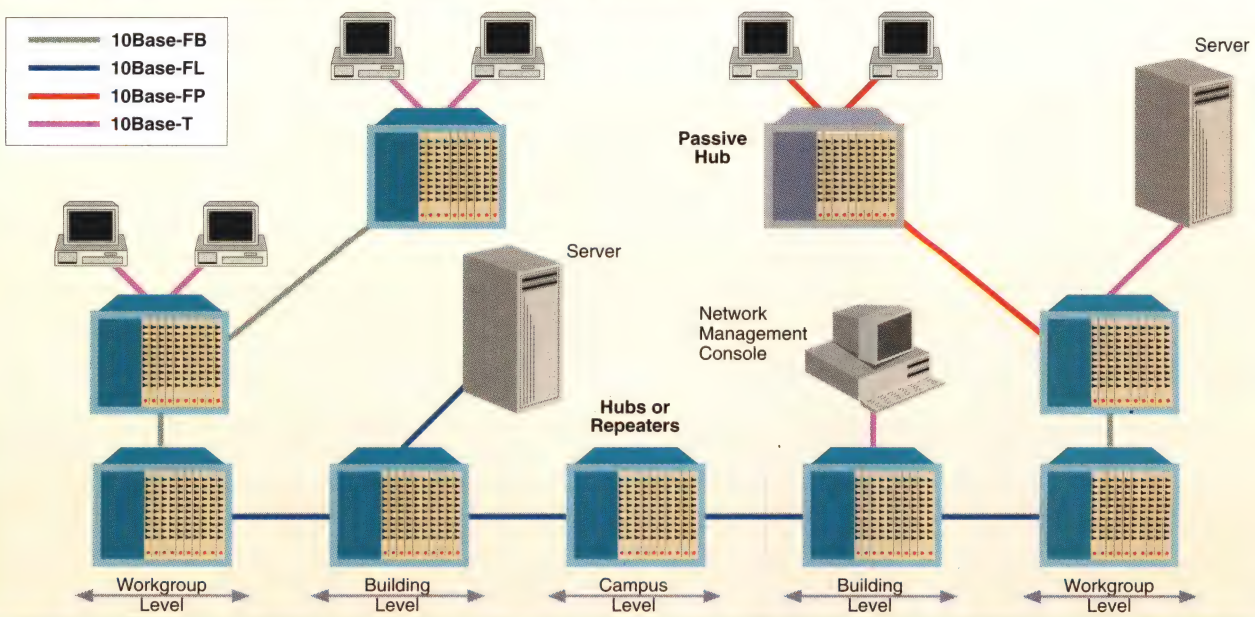
The IEEE 802.3 committee embarked on the standardisation process that led to the 10Base-F suite for one simple reason: the FOIRL standard was not able to keep pace with growing Ethernet installations. With FOIRL's 1km segments and four-repeater limits, users had no choice but to turn to proprietary wiring solutions or install expensive bridges and routers to extend their Ethernet backbones.

Ethernet backbones are typically constructed by interconnecting two or more cable segments with a repeater, a device that regenerates the data signal to correct any signal attenuation that occurs. For coaxial cabling, segments may be no more than 500 metres long; after 500 metres, attenuation degrades the signal to the point that unacceptable error levels can occur. FOIRL, ratified as a standard in 1987, expanded that distance to 1km.

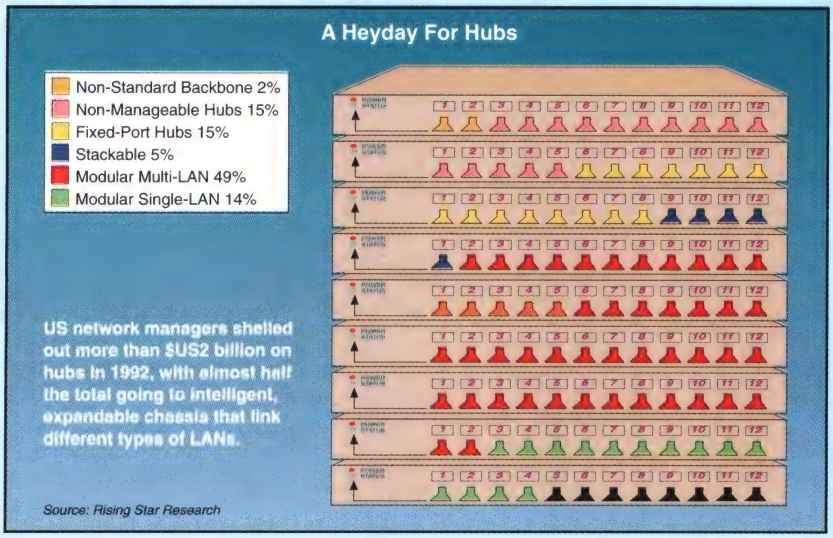
The main problem with the 1km limit is that it isn't enough to accommodate most in-building and campus networks. In its 1991 Commercial Building Wiring Standard, based on surveys of typical building and campus environments, the US Elect-

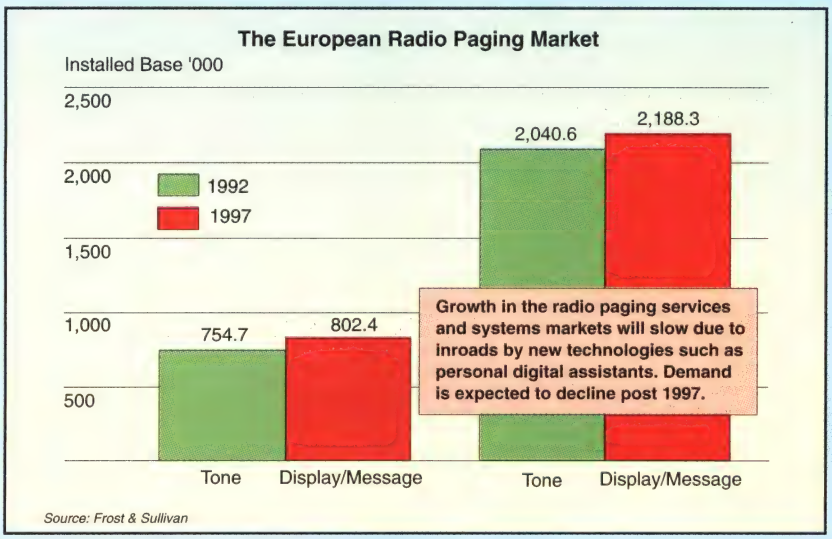
Three Flavours of 10Base-F

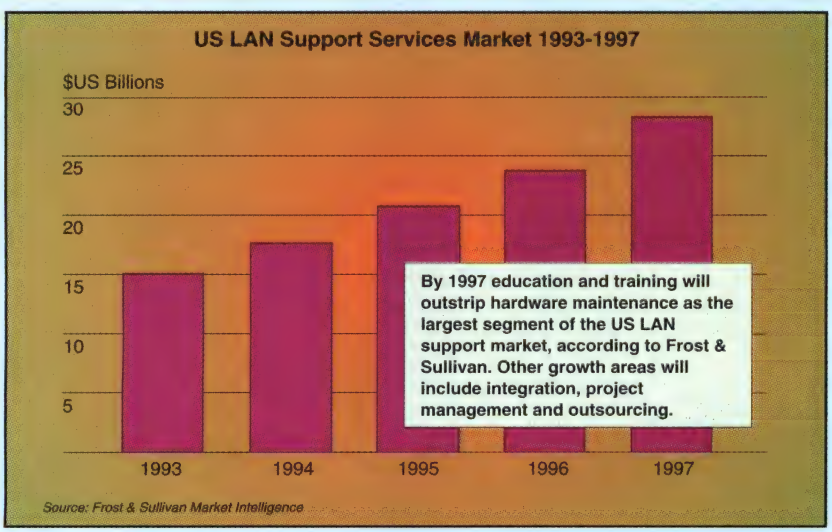
By equipping hubs with different interface cards, network planners can build an Ethernet backbone that comprises all three components of the 10Base-F standard in a three-level scheme for campus, building, and workgroup connections.



Market Watch







ronics Industries Association/Telecommunications Industries Association (EIA/TIA) specifies that cable segments of at least 2km are needed to accommodate connections between 'main cross connects' and satellite wiring closets in most campus and building wiring installations. By boosting allowable segment lengths to 2km, 10Base-F meets EIA/TIA wiring guidelines.

Along with signal attenuation, builders of Ethernet backbones have to deal with delays that limit backbone distances. With Ethernet's CSMA/CD (carrier-sense multiple access with collision detection) protocol, two stations transmitting from opposite ends of a network must be able to detect the occurrence of collisions so that they can complete retransmissions of any errored packets. If the round-trip delay is too great, a collision may not be detected by the transmitting station, opening up the chance that errors are not corrected.

Variable delay through an 802.3 network also puts constraints on network design. As packets traverse the LAN, the spacing between them can change; the longer the distance travelled, the greater the potential change in spacing. If a packet is significantly delayed relative to a following packet, the spacing between those packets will shrink. If packet spacing becomes too tight, network interface cards may not work properly.

Given the performance characteristics of Ethernet backbones built with FOIRL, the FOIRL standard specifies a limit of four repeaters for a compliant fibre backbone. Extending FOIRL beyond those four repeaters invites delay variability errors that would make the backbone unreliable.

Enter 10Base-F, which includes some more recent technology that improves signal quality and reduces end-to-end delay variability for fibre-based Ethernet backbones. With its performance improvements, the maximum length of an Ethernet backbone can be extended to 4km. Delay restrictions prevent the creation of backbones longer than that.

Different Technologies

The three specifications that make up 10-Base-F use different technologies to provide different wiring solutions. Although a single backbone can include 10Base-FL, 10Base-FB and 10Base-FP links, the ports for those links are not interchangeable. Hubs or repeaters must be equipped with separate ports to handle those technologies.

Theoretically, this restriction isn't different from the way copper-based Ethernets work; an Ethernet hub must have 10Base-T ports for twisted-pair links and 10Base-5 ports for coax links. In practical terms, however, it means that equipment vendors will have to develop three sets of products for the three 10Base-F standards — a task that they may or may not be willing to take on.

Of the three 10Base-F standards, the most likely to gain user and vendor attention is 10Base-FL. Because it can be used to connect workstations as well as repeaters, 10Base-FL is the likeliest candidate for in-building wiring schemes. Many users are looking to install fibre cable to desktops as part of a long-term upgrade plan that will be able to accommodate future high-speed technologies and applications. 10Base-FL gives these users a standard way to deploy fibre in existing networks.

Of course, the need for fibre to the desktop has become less certain of late due to significant advances in twisted-pair technology. ANSI already has endorsed the transmission of 100Mbps signals over category 5 copper wire, and some vendors are talking about transmitting 155Mbps ATM signals over copper. Still, because fibre is inherently superior to copper media, it always will provide the best performance, especially for bandwidth-intensive video and multimedia applications.

In addition to allowing 2km fibre segments as opposed to FOIRL's 1km limit, the 10Base-FL spec allows for a maximum of five repeaters on a backbone, one more than FOIRL. Five repeaters are necessary to implement three-level distribution systems encompassing workgroup, building, and campus connections. 10Base-FL's distance advantage comes from the use of a more sensitive optical receiver and a more powerful signal for data transmission.

10Base-FL is also backward compatible with FOIRL, meaning that a hub with 10Base-FL transceivers can be interconnected via fibre with a hub that has FOIRL transceivers. When such a connection is made, the FOIRL 2.5km distance limitations apply, however.

For Backbones Only

Unlike 10Base-FL, 10Base-FB is intended for one purpose only; to interconnect Ethernet repeaters. Any repeater conforming to the 10Base-FB standard must be equipped with a built-in transceiver; 10Base-FL allows for transceiver modules that can be built into repeaters, hubs, or network interface cards.

By treating 10Base-FB as a backbone-only technology, the IEEE 802.3 committee was able to create a standard that allows up to 15 repeaters to be cascaded in a backbone. Each segment can reach a maximum of 2km, although segment lengths must be shortened in networks comprising other media.

10Base-FB gets its long-distance legs primarily from the use of synchronous signalling. With synchronous signalling, optical signals are retimed upon transmission and reception. With conventional asynchronous signalling, used in FOIRL and 10Base-FL, no such retiming takes place. The advantage of synchronous signalling is

Technology Update

Home-Grown ATM, ISDN Routing

These days not all leading edge router technology has to come via the US — just ask Melbourne-based Datacraft or New Zealand's Network Dynamics. Datacraft revealed in October that it has signed an agreement with Telstra International (formerly OTC) which will lead to the incorporation of an ATM interface into its Australian designed and manufactured AP4000 OpenRouter product line. Datacraft Managing Director, Peter Pryor, said the agreement with Telstra leverages the ATM switching work undertaken by the research arm of OTC. Pryor, who says that Datacraft has applied to join the US-based ATM Forum, maintains that the company will ship ATM-capable AP4000s before the end of next year. Across the Tasman, Christchurch-based Network Dynamics says it will soon release a new version of its ACE Router which features an integrated ISDN terminal adaptor. Officials claim the new router features a single port Basic Rate ISDN interface providing twin 64Kbps channels (which can be aggregated to 128Kbps), D Channel out-of-band signalling, and a Primary Rate ISDN module. Extensive SNMP-based triggers and traffic management are also supported, they say.

Acquisitions May Signal New Technologies

The imminent arrival of ATM and other switched technologies seems to be having a pronounced effect on hub and router vendors, if three recent, and significant, company acquisitions are anything to go by. The acquisitions could pave the way for a new breed of networking equipment which will combine switching, routing and signalling in the one box. Firstly, the world's leading router vendor, Cisco Systems, bought California-based Crescendo Communications, manufacturer of high-speed LAN adaptors and hubs. Secondly, Network Systems Corporation picked up hub vendor Bytex. And finally, the No. 1 vendor of modular LAN hubs, SynOptics Communications, acquired Coral Network Corporation, a maker of high-end routers. While hubs and routers have traditionally been viewed as very distinct and separate entities, it seems vendors are now poising themselves to deliver technology outside their core area of expertise, so they can benefit from the expected strong growth in switched LAN technologies like 100Mbps fast Ethernet and ATM.

Second V.fast Interim Modem Spec

The ongoing delays in the development of the ITU-TS standard for V.fast (also called V.34) modems has resulted in a second interim specification being put forward. The spec, known as V.fast Class, has been proposed by Rockwell International, based on its own version of the 28.8Kbps scheme. This second proposal appears to have more vendor support than the previous interim proposal, V.32terbo, with 126 modem manufacturers — representing 85% of the modem market worldwide — currently pledging their backing. Rockwell says the V.FC spec has several advantages over V.32terbo — it is faster, and features adaptive pre-emphasis and line probing techniques that give it greater immunity to noise. Until the V.34 spec is formally approved, it's unclear what will be involved in upgrading V.fast Class modems to V.34.

Cabletron Forms Switched Ethernet Consortium

Cabletron Systems has announced the formation of a consortium of eight leading vendors to develop and deliver interoperable products which will incorporate a full duplex switched Ethernet (FDSE) access method. FDSE technology allows switched Ethernet networks to perform bi-directional 10Mbps transmission between two nodes, providing an aggregate throughput of 20Mbps. The consortium members include Compaq, IBM, Kalpana, National Semiconductor, NCR, SEEQ and Texas Instruments, and interoperability testing will be performed by an independent lab. Cabletron first introduced FDSE in late 1992, and a number of vendors have since released products based around the technology. The principle aim of the consortium will be to ensure complete interoperability between all FDSE products on the market. In order to accommodate existing FDSE products, the consortium's proposal includes a backward compatibility feature.

ATM Forum Embraces UNI 3.0, Shuns IBM

The ATM Forum has announced its support for version 3.0 of the user-to-network-interface (UNI), which supports signalling and traffic management for switched virtual circuits between customer premises equipment and the public ATM network. But the Forum has rejected IBM's initial proposal of a 25Mbps standard to run ATM over Type 3 unshielded twisted pair wiring, and is now focusing its attention on two competing proposals which would allow ATM transport at 51.84Mbps. IBM is sponsoring one of these proposals, while the other is backed by AT&T and Hewlett-Packard. The IBM spec is based on technology known as a Binary Partial Response (Bpriv) line encoding scheme, while the AT&T/HP scheme, known as CAP-16, uses a different encoding scheme. IBM says while the CAP-16 system offers more efficient bandwidth utilisation, it requires a more complex chip set, which will mean products based around it would be more expensive. IBM said it intends to continue to work on both its 52.84Mbps and 25Mbps versions.

that data packets aren't corrupted upon transmission or reception. With asynchronous signalling, a variable number of bits in each packet's header may be lost in transmission or reception. When multiple repeaters are cascaded, packet corruption can reach intolerable levels.

10Base-FB also allows signalling to be performed for the purpose of remote fault diagnosis. If an error condition such as jabbering (transmission of excessively long packets) occurs, the receiving 10Base-FB transceiver sends a 1.67MHz signal back to the transmitting unit notifying it that there is a problem. The unit can then report the problem to a network management console.

This feature could enable network planners to build fault-tolerant net backbones. When a link goes down, the fault signal could be used to initiate a switch to a backup system. Although some proprietary fibre optic products provide this capability now, 10Base-FB offers a standard approach.

Passive Partner

While 10Base-FL and 10Base-FB are geared toward large Ethernet backbones, 10Base-FP is targeted to smaller installations, including workgroup LANs. It specifies a passive star hub that can be used to connect optical transceivers built into network interface cards, repeaters, or hubs. The passive star hub uses no power and is completely immune to external noise. This makes 10Base-FP a good choice for computing environments that are electrically noisy due to the presence of factory machinery, including generators. In such environments, interference from most industrial equipment makes transmission over conventional cable impossible.

Up to now, passive hubs with fibre connections have been based on proprietary technology. The passive hub called for by 10Base-FP supports a 500 metre radius from hub to transceiver. Although the standard doesn't specify the number of ports to be included, proprietary passive hubs now on the market offer up to 33 ports. It's likely that products conforming to 10Base-FP will have similar configurations.

New Rules

To date, network managers pushing the envelope of Ethernet design — building networks that support the longest distances possible, the greatest number of nodes, and most complex topologies — have had little in the way of hard and firm design guidelines available to them. The few design rules published by the 802.3 committee gave only general guidelines for distance and topology restrictions. They were also devised under the assumption that repeaters were the primary network building blocks. However, the arrival of new wire-speed routers, bridges, and switches has put a big hole in that assumption.

Work on 10Base-F has generated an ancillary benefit in the form of a more complete description of the permissible topology limits for all CSMA/CD networks. The revised design guidelines incorporate the new fibre standards and specify spreadsheet-based methods for determining permissible network topologies. The values to be used in the spreadsheet calculations are included in a new chapter in the published 802.3 standard, which is available from the IEEE.

Early indications from equipment vendors is that 10Base-F will gain broad support in the marketplace. US chip maker Microlinear is already shipping a 10Base-FL interface chip that provides all the components necessary to build a complete 10-Base-FL transceiver. Although details are still forthcoming, a number of hub vendors have announced plans to support 10Base-F in their products.

In developing its new standard, the 10Base-F committee tried wherever possible to incorporate existing technology to keep implementation as easy and inexpensive as possible. In the case of 10Base-FL, for instance, chips are almost identical to those used in 10Base-T implementations. This will allow the migration of 10Base-T silicon to 10Base-FL with a minimum of difficulty.

Frederick Scholl is President of New York-based consultancy Monarch Information Networks. He also is co-chairman of the IEEE 10Base-F standards group.

ATM

ATM Another Wollongong First

Is ATM actually starting to arrive? It's racing along at a faster pace than any of the rival technologies in the past few years — and it's beginning to come at us from two directions. There's a push coming from the LAN interconnect area, where router vendors are falling over themselves to install ATM cell switching into their products; and another from the carriers, where ATM is seen as a leg-up into the brave new world of public-access Broadband ISDN.

If you discount Telecom Australia's recent announcement (see 'Telecom Signals ATM Start,' *Australian Communications*, October 1993) that it will build an experimental ATM network (because this won't be until late next year) then the first to jump on the bandwagon in Australia is the University of Wollongong, which has recently bought a couple of SynOptics LattisCell Switches (Model 10104).

It's hard to think of a better trial location for this new technology. Under Professor Gary Anido, the Telecommunications Engineering faculty of the university has become a very active telecommunications research organisation and, not far away on the same campus, there is the Centre for Information Technology Research (CITR), with its close links with NorTel and Telecom's R&D arm. Next year there are plans for the university to introduce a Bachelor of Engineering in Telecommunications Engineering — further bolstering its status as a specialist telecommunications centre.

The SynOptics' switches will be used as part of the university's Advanced Telecommunications Research Program, which will initially use ATM distribution for teaching (video distribution), and to link the Engineering faculty's own internal computer network facilities.

Video Opportunity

Part of the university's interest in ATM stems from an expansion of the central lecture block into a 'Communications Centre' with lecture halls having multimedia capabilities. There's also a TV studio which will broadcast through SBS, and these facilities will also be linked to produce distance-learning videotapes.

Currently the university campus is interconnected by Ethernet and by special video feeds running on separate optical fibres. "So this is an excellent opportunity to explore the capabilities of ATM switches to handle video as well as data," Anido says.

Eventually this Communications Centre will distribute lecture material off-site, both to regional campuses and to other Australian universities (there is already a close relationship with the University of Technology in Sydney).

The Wollongong area was also recently chosen for Telecom's fibre-to-the-kerb and to-the-home trials, but there are currently no plans to extend ATM's reach into these domestic networks.

Initially the university campus will be linked through a number of SynOptics LattisCell switches, each of which can provide 16 full-duplex ports (8-to-8) running to 155Mbps. ATM provides automatic rate adaptation, so there's no problem in statistically multiplexing different requirements over the same shared fibre network.

According to Alan Pedigrew of SynOptics, the LattisCell ATM switch has a total throughput of around 2.5Gbps (16 x 155-Mbps) "but the internal fabric is 5Gbps — so we have the ability to speed up the cells in multicast situations. It has a hardware copy fabric in the switch, where you can make *n* copies, and multicast them to any output port," he says. "The higher internal

speed allows us to buffer any incoming cell which might be in collision with one already passing through a switch element — so the 5Gbps clock rate makes up for lost time," he explains.

This is a true fast-packet, Banyan-type switch (other ATM systems rely on a router-like shared-bus mechanism) which will only buffer a cell if the path through the switch is blocked. It applies 'back-pressure' to force microsecond delays if two cells contend for access to a switching element. If a cell is already in transit through an element, a signal is sent back through the switch-chain to force an incoming cell into a temporary buffer — but the delay can never be more than 3 microseconds.

LattisCell can use both Virtual Path (VPI) and Virtual Circuit (VCI) Identifiers in the cell header. ATM reduces or eliminates network complexities associated with segmenting LANs with bridges and routers, and both high-speed ATM LANs and (WAN) interconnection will be trialled with these switches.

This is one of the values of true ATM, Anido says: "If you want to build a private network that interconnects high-speed LAN sites seamlessly, then you really need to increase the WAN bandwidth substantially. And with ATM, for the first time, the technology being used for both interconnection and in the local area net will be the same."

Anido's faculty has a research agreement on ATM resource control with the Defence Science and Technology Organisation (DSTO) which already has an ATM-based trial network running between its Salisbury (SA) laboratories and Telecom's Clayton (VIC) research laboratory. The university also has related research projects with AWA and Ericsson.

Stewart Fist

ATM

Sprint, WilTel Jump US ATM Gun

While Telecom Australia has revealed plans to start an experimental asynchronous transfer mode (ATM) network late next year, US carriers Sprint and Wiltel already have services up and running. But although other US carriers are expected to follow suit with an ATM service, many industry observers predict it may not be for a few years yet.

Although Sprint has garnered much of the hype in US as the first company with nationwide ATM service, WilTel is just as far along. The Tulsa, Oklahoma-based company has NEC ATM switches already installed, so it is just as far along as Sprint, said Frank Dzubeck, President of Communications Network Architects, a market research firm based in Washington, D.C.

"First doesn't mean anything in this ball game. He who gets there first is not necessarily the winner," Dzubeck added.

MFS Datanet is also offering ATM services on a local basis (10 cities) and uses WilTel as the connection mechanism. And BT has purchased AT&T switches to implement ATM. Telecommunications industry observers say that one outcome of the BT-MCI alliance may be a global ATM network. Sources at BT in the US declined to make comment.

Both WilTel and Sprint have secured beta customers to test their offerings. WilTel actually began offering its first ATM service — Channel Networking Service (CNS) — in March. CNS allows customers a direct migration path from a private-line channel networking service to an ATM service. Applications include centralised or remote data storage, disaster recovery, distributed data processing, performance improvements of peripheral devices and geographic consolidation of operations.

The pricing structure is based on an all-inclusive per-channel basis, providing customers with a 20-40% saving over the current solutions for host-to-host and host-to-peripheral communications, WilTel said. WilTel's first ATM beta customer is Texas-based Convex Computer.

Eight NEC NEAX 61E ATM switches will be operational in the WilTel ATM network late this year. Switch sites are located in Los Angeles, Phoenix, Denver, Dallas, Chicago, Atlanta, Washington and New York. Eight additional switch sites will be activated throughout 1994 in Seattle, San Francisco, San Diego, Des Moines, Houston, Nashville, Orlando and Boston. Finally, late next year and early 1995, switch sites will be set up in Albuquerque, Kansas City, Tulsa, Detroit, Jacksonville, Raleigh, and Philadelphia.

Sprint announced in late August that its ATM service was commercially available through the company's long distance network and accessible from any of its more than 300 network locations nationwide. Hughes Aircraft will use the service as Sprint's first beta site in a pilot project to link local area networks at sites across the country. Pricing is based on either a flat rate or a usage rate at approximately $US30,000 per port per location.

Sources at Sprint admit the technology is not yet selling. Cost is the factor at this point, so therefore, since it's so expensive, other carriers such as MCI and AT&T will wait to get in until they can get the cost points down, Dzubeck explained.

Ann Steffora

Distributed Applications

Novell Takes a Stab at Middleware

When it announced its Appware framework for developing network applications, Novell showed it can talk the same talk that users have been hearing from other prospective middleware vendors. Soon, those users will find out whether the operating system giant can back up its words with a cross-platform development environment that works.

Novell has slapped a March 1994 delivery date on its initial release of Appware. Selected customers are supposed to get their hands on the product late this year, while some already are working with discrete components of the development tool.

Early users of Appware components are giving Novell's technology high marks for its ability to trim the time and cost involved in developing applications. For instance, developers at Big Six accountancy firm Ernst & Young say they used core elements of Appware to complete a projected one-year development project in six weeks. Novell is counting on such savings to spur Appware past competing middleware products like Visual Basic from Microsoft, Pipes Platform from Peerlogic, and Covia Integrator from Covia Technologies. Middleware is the enabling layer of application program interface software between the network and the application (see 'Making the Network Safe for Distributed Applications,' *Australian Communications*, June 1992).

As encouraging as the early reports have been, users won't be able to gauge Appware's ability to deliver distributed applications until the total package is in their hands. Other vendors have promised the kind of mega-platform for application development that Appware is supposed to provide; but up to now, no one has been able to fulfill those promises. Part of the problem involves scope — today's networks contain such a rich mix of platforms, operating systems, and protocols that a programming tool encompassing everything may require more computing power than even the fastest workstation can muster.

Unburdening Programmers

Like its rivals, Appware is aimed at relieving application developers from the burden of having to rewrite code for every kind of operating system, user interface, and service available on a given network. Appware has two main elements: Appware Foundation and Appware Bus (see Figure 1 on page 31). Appware Foundation comprises a set of application program interfaces (APIs) that make calls to specific operating systems, user interfaces, and network services. Once these APIs are in place, developers using conventional programming languages like C, C++, and Pascal can create one application that automatically is ported to any operating environment covered by the APIs.

Appware Bus is targeted at developers using object-oriented programming techniques. The bus is a software engine that connects object code known as Appware Loadable Modules (ALMs). Programmers create applications by linking ALMs, which handle such tasks as calls to database programs, network services, and the like. The ALMs, like the Appware Foundation APIs, are created using conventional programming languages. As part of its Appware effort, Novell also is releasing an object-oriented development tool, Visual Appbuilder.

Conditional Prospects

Appware's prospects for becoming a leading development environment for network applications hinge on several factors. One is whether corporate developers are willing to accept a programming environment that is so firmly rooted in LAN technology. Al-

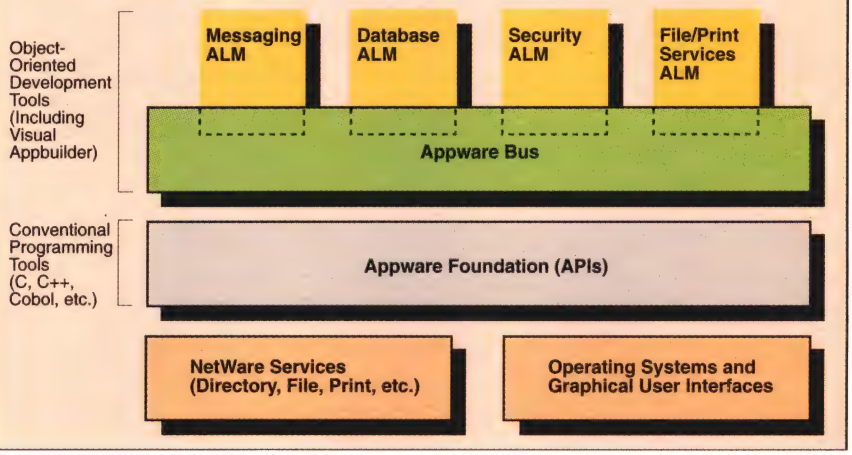
though Novell has not been specific about the APIs it will make available in Appware's initial release, the vendor has said Appware will eventually include APIs for DOS, Windows, Windows NT, OS/2, Macintosh, and Unixware desktop machines, as well as NetWare and Unixware servers. Notably absent from this list are operating environments like Apple's Open Collaborative Environment, VINES from Banyan Systems, DECnet, and IBM's APPC. Novell apparently will rely on third parties to write APIs and ALMs for such environments.

Novell's LAN leanings also are evident in the way Appware works. Novell uses what is called an object request broker to act as an intermediary between clients and objects. Instead of communicating directly with each other, objects interact with object request brokers, which reside on NetWare servers. Novell's implementation of the object request broker, which the vendor calls a Distributed Object Management System, is based on the Common Object Request Broker Architecture. CORBA was developed by the Object Management Group, a group of vendors developing guidelines for object-oriented programming.

The Appware approach works well for simple client-server applications, in which an object request broker coordinates the exchange or requests and replies between a workstation and a server. This process might involve locating a service that a client needs and then selecting the route to send the request from the client application to the appropriate server.

Figure 1: Novell's Application Building Blocks

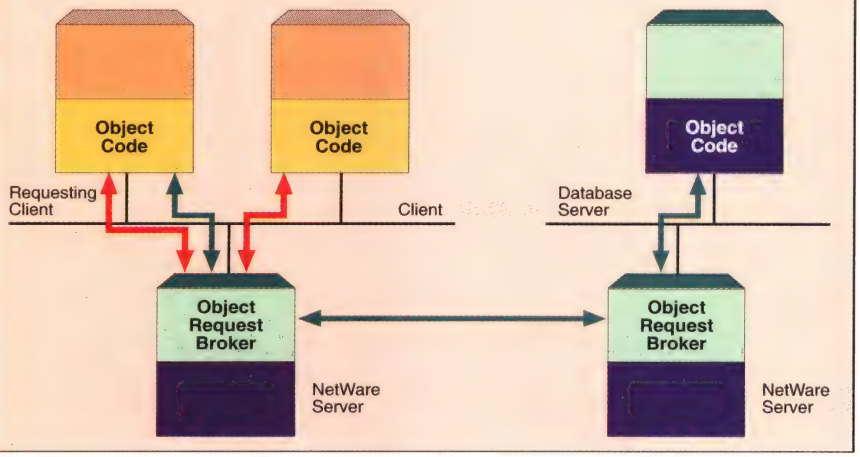
Appware offers two layers of programming help for building network applications. With Appware Foundation, developers using conventional programming languages can port single applications to several operating systems or user interfaces by writing to APIs. Appware Loadable Modules (ALMs) linked to the Appware Bus software engine offer an object-oriented approach to application building.



But many enterprise-wide distributed applications need more than a simple client-server approach. For example, an application that requires data from a mainframe program needs a message passing mechanism to get beyond the server. Although

Figure 2: Brokering Appware's Object Links

Under Novell's Appware, object code is located on workstations and servers throughout the network. All requests for objects are handled by object request brokers, which reside on NetWare servers.



Novell says Appware, as a distributed environment based on CORBA, will be able to handle this type of enterprise-wide message passing, users may be more comfortable with middleware products that have built-in message passing, such as Pipes Platform or Covia Integrator.

The offerings from Peer Logic and Covia let users link applications running on a broader range of hosts than Appware is expected to cover, at least in its initial release. For a company that needs to develop a client-server application that also taps into a transaction processing host Appware will not fill the bill. Programmers could write remote procedure calls (RPCs) to access the mainframe, but that defeats the purpose of using Appware to reduce the amount of code needed for applications.

Client-Server Strength

Even if Appware eventually comes up short in handling every conceivable type of enterprise network application, it could thrive as a money-saving tool for client-server applications. Tools like Pipes Platform and Covia Integrator may do a better job with higher-end systems, but they don't cover the range of client operating systems and interfaces included in Appware and Microsoft's Visual Basic.

Although it obviously is too early to tell how successful Appware will be in fulfilling Novell's aggressive agenda, first indications from users are promising. Ernst & Young in the US has already used core elements of Appware to drastically cut application development costs.

The accounting firm needed a custom time-sheet application that would allow accountants assigned to customer sites to dial into a host, record the hours they've worked on a project, and then have the system automatically bill the client for those hours. On the assumption that conventional programming tools would be used, the company expected the project to take 12 to 14 months to complete, at a cost of $US1 million. With Appware, developers completed the project in six weeks at a total cost of $US100,000.

With Appware, developers using conventional programming languages can write a single version of a distributed application to access a given network service, rather than compiling separate code for every operating system or user interface that needs the service. For developers using object-oriented programming tools the labour-saving potential of a development environment like Appware is even more impressive. Object-oriented programming speeds application development by letting programmers reuse blocks of code (objects) that perform common tasks, such as messaging, database access, printing, or file access. For instance, an object that handles database storage and retrieval would include both a database engine and the data.

Object-oriented programming is done in a visual development environment where programmers click on icons that represent the objects and then schematically link the icons to build an application. As part of Appware, Novell will offer an object-oriented programming tool called Visual Appbuilder. The vendor also says that 'compatible' object-oriented languages from third parties will work with Appware, but it has yet to spell out exactly what that compatibility entails.

Many object-oriented developers' tools come with a collection of objects that handle common tasks (reading and writing files and database services, for example). Novell says it will take the usual collection a step further by providing objects — ALMs — that access specific client and network operating system services. For instance, rather than a generic database call, programmers will be able to click on an ALM tailored to a specific database, such as Oracle.

For Novell, the trick to offering this kind of object richness is to get third parties to create ALMs for specific products and services. Several vendors already have signed on to build ALMs. Cheyenne Software is creating modules for imaging and document management, while Wall Data is developing ALMs that let clients access mainframes via TCP/IP's Tn3270 protocol, as well as others that access IBM AS/400s and DEC VAX computers. Such ALMs will let programmers create applications based on APPC. Other vendors that have said they will develop ALMs include Borland, Gupta Technologies, Oracle, and WordPerfect.

Even with this support, Novell will have to work hard to wrest prospective users away from Microsoft's Visual Basic. One advantage that Appware holds over Visual Basic is its broader client support — the current version of Visual Basic does not accommodate OS/2 or Unix clients. Some Visual Basic applications require programmers to create PC and Macintosh versions of a single program. Microsoft has said that eventually all its Visual Basic products will run on both Macs and PCs.

Novell's apparent reliance on third parties to develop ALMs beyond the core set the vendor will offer is consistent with the approach it took to create Appware. Novell bought much of its Appware technology from three companies.

Appware Foundation is based on technology that Novell acquired from US-based Software Transformations. Software Transformations sells a tool kit called the Universal Component System, which provides a common API for applications to work on a wide variety of platforms. In essence, Novell is repackaging key elements of the Universal Component System as the Appware Foundation.

The Distributed Object Management System integral to Appware Bus comes from technology developed by Hyperdesk. Novell bought a 20% share in Hyperdesk last January. The Hyperdesk product is considered to be one of the most advanced object management products on the market and is the first to fully comply with CORBA specifications. Within Appware, the Distributed Object Management System is a NetWare Loadable Module (NLM) that runs on NetWare 3.X or 4.X servers, or on servers running NetWare Runtime.

Finally, the Visual Appbuilder development environment comes courtesy of Novell's acquisition last May of Serius Corporation, developer of Workshop, a visual program development tool that lets programmers build objects that can be linked schematically and then compiled. Visual Appbuilder is a repackaging of Workshop.

Salvatore Salamone

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Data Security

Clinton's Clipper: Can it Keep a Secret?

On the surface, the Clinton Administration's initiative to deliver low-cost, high-speed encryption to US companies courtesy of a government-developed chip known as the Clipper sounds like a good deal. But its related policy to ease many of the restrictions that determine how and where encryption equipment can be deployed in non-US hands has proved troublesome. The controversial plan is for the government to keep what amounts to a spare set of 'keys' to every device that incorporates the Clipper. Thus, if law-enforcement agencies obtain court permission to listen in on scrambled messages and conversations, they'll be able to do so.

But as critics of the proposal have been quick to point out, such duplicate keys also could be used for illegal electronic surveillance. Unfortunately, that's not the only controversy surrounding the new silicon.

At 20Mbps, Clipper is fast enough to process voice, data, fax, and video. The Data Encryption Standard (DES) is mainly used for data and voice (video encryption is possible, but it's slow and expensive). But DES is now widely deployed, particularly in the financial industries. Companies are not likely to toss it out just for the chance to secure video and fax transmissions. Thus, two encryption schemes will probably coexist, unless — as some sources suggest — the government refuses to recertify the older standard and replaces it with Clipper.

Even if this comes to pass, though, Clipper — like DES — can only be used for encryption, not for authentication. As more and more companies decide they need both types of protection, Clipper will have to be augmented. Right now, there are two competing authentication schemes: the Digital Signature Standard (DSS), from the National Institute of Standards and Technology (NIST), and the Digital Signature Algorithms developed by RSA Data Security.

DSS has yet to be approved, but once that happens it will be used by all US federal agencies and the companies they work with. RSA's technology is already employed in many products, including those from Apple, IBM and Microsoft.

Finally, it remains to be seen whether Clipper will be approved by various standards bodies and its use mandated by major industry organisations. So far, few details about the silicon have been released. And information about Skipjack, Clipper's encryption algorithm (sometimes referred to as the 'Al Goreithm'), is even tougher to come by.

The Key Club

Clipper is the handiwork of the US National Security Agency (NSA). California-based Mykotronx will sell the chip to device manufacturers for about $US20; other distributors will be named. AT&T, the first company to endorse the chip, plans on adding Clipper to its cellular phones.

Like all encryption equipment, Clipper uses a secret key to encode and decode data. If the US Government has its way, all Clippers will be issued with two identical keys. One key would go to the end-user; the other would be cut in half, with each part being held by an as-yet-unspecified government agency (dubbed a 'key escrow system').

The purpose of splitting the key is to protect the privacy of law-abiding Clipper users. By having different agencies store each half of the key, there's little chance of a rogue government employee peeking at private communications. Such safeguards and assurances have done little to stem the public outcry, though, and the proposal has already been the subject of several hearings in Congress.

Virtually all commercially available encryption products use one of two technologies: DES or RSA. DES, which was originally developed by IBM, has been widely deployed since 1977. RSA is used in Apple's System 7 OCE, Lotus Notes, and Microsoft Mail (among others). RSA also supplies digital signatures for authentication, something DES and Clipper lack. DES is a symmetric (or secret key) scheme, which means that both the sender and the receiver of a message must use the same key. RSA is an asymmetric (or public key) scheme that uses two keys. A private key is issued to each user and a public key is stored in an open directory or distributed.

While DES and RSA are often viewed as competing technologies, it's actually very common for the two to be used in tandem. A government agency, for instance, might be required to use DES. But transmitting a secret key across a network can be a risky proposition. If it's intercepted and copied, the security of all messages intended for a particular recipient would be compromised. But if a secret DES key is first encrypted with a public RSA key, it can be transmitted over a network safely, since the intended recipient could then decrypt it with a private RSA key.

The Clipper controversy comes after the ill-starred introduction of NIST's Digital Signature Standard. Like Clipper, DSS is a government initiative that addresses data security. In this case, though, authentication, not encryption, is the issue. DSS uses digital signatures to determine if a message actually comes from a particular sender and ensure that the contents have not been altered.

The trouble with DSS is that NIST developed its own digital signatures, rather than adopting RSA's widely implemented technology. Digital signatures are typically created by taking a message's content and running it through a program called a hashing function, which produces a binary number that represents the file. That number is then encrypted using the sender's private key, creating the digital signature that is appended to the file. Both are then transmitted over the network.

At the other end of the exchange, the recipient separates the digital signature from the file and uses the system's public key to decode the signature and reveal the binary-based output. The file is then run through the same hashing function, and the output is compared with the binary number that was contained in the digital signature. If the two hashed outputs match, the file is authenticated.

Spy vs Spy

The US State Department requires all encryption products used outside the country to be licensed for export. In general, authentication equipment is awarded blanket approval. A word processing program with a digital signal feature, for instance, is usually OK'd for widespread distribution. Encryption products are another matter. Typically, encryption gear that employs longer keys faces more stringent export regulations. That's because the larger the key, the harder it is to break the code.

The export regulations affecting DES and RSA are fairly well defined. DES products require case-by-case approval from the US State Department, and it's only rarely granted. When RSA is used only for authentication, export is typically allowed regardless of key size — as long as the user is able to clearly demonstrate that the product cannot easily be converted to cryptographic purposes.

When RSA is employed for encryption, the State Department will not allow export if keys exceed 512 bits. For users who need private key encryption but can't export DES product to certain locations, alternatives have been developed that can be dropped into an application in place of DES.

RSA has been incorporated into several formal standards, as well as approved by various industry groups. The ISO 9796 security standard lists RSA's algorithms as acceptable. RSA also is part of the X.509 security standard for messaging from the ITU-TS and is part of Internet's Privacy Enhanced Mail (PEM) message security spec. All three RSA hashing functions also are endorsed in PEM. RSA also is included in the SWIFT (Society for Worldwide Interbank Financial Telecommunication) standard and PKCS (Public Key Cryptography Standards), a set of specifications developed by Apple, DEC, Lotus, Microsoft, MIT, RSA, and Sun.

Salvatore Salamone

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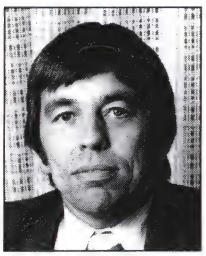


Managing X.400 Systems

Alan Lloyd

An X.400 messaging system can only reach its full potential value if it is managed in a logical and coherent fashion. The management framework for messaging and the 'managed objects' within the messaging system itself conform to related ITU-TS (formerly the CCITT) management standards — the X.700 series, covering CMIP, OSI management functions and object methodology, and the M series (for Telecommunications Management Network — TMN) for network maintenance.

Driven by carriers, X.400 is evolving into a global messaging system which will have full management facilities. The relationship of OSI standards at the application layer (e.g. X.400 interacts with X.700 and X.500 directories) means that a global messaging/directory system is now being engineered to support commercial requirements.

X.400 MHS (Message Handling System) systems have five major components — the Message Transfer Agent (MTA), the User Agent (UA), the Message Store (MS) and the Reliable Transfer Service (RTS). There are also Access Units which permit delivery to fax and telex systems. These components are analogous to a post office (the sorting, routing office, or MTA), the user's post box (the UA) and the postman (the RTS). The Message Store (MS), which was added in the 1988 version of X.400, is an option between the UA and the MTA. The MS is essentially a post box provided for the user by the postal service. Access Units provide functions such as converting a wire telegram to its physical form.

Message Transfer Service (MTS) is the term applied to one or more MTAs which collectively provide the core message service to UAs. The 1988 version of X.400 contains major enhancements to the 1984 version. The added functions in this version are the interfaces to the X.500 EDS, security services, physical delivery gateways to fax, and telex, and the Message Store (MS). With combined X.400 (1988 version) and X.500 services, a high degree of planning and analysis of business-related requirements need to be considered before a wide scale implementation.

Figure 1 shows how the basic 1984 X.400 system, with 1988 enhancements, integrates with X.500 directories. The X.500 directories in this case are used by the X.400 service to expand distribution lists, authenticate users, map local names to real X.400 addresses, provide statistical and MTA capability information, and to enable MTA routing decisions.

The diagram also shows the other elements of OSI standards related to documents, message types and message management. These include EDI, voice mail, physical delivery (fax, telex), X.700 management (CMIS/P and TMN) and the newer standards of group communications and Document Filing and Retrieval (DFR) systems.

This is one of a series of open systems tutorials by Alan Lloyd, Strategic Developments Manager for Datacraft Australia. Alan represents Australia on numerous international standards bodies and is the co-author with Gary Dickson of *Open Systems Interconnection* (Prentice Hall, 1992).

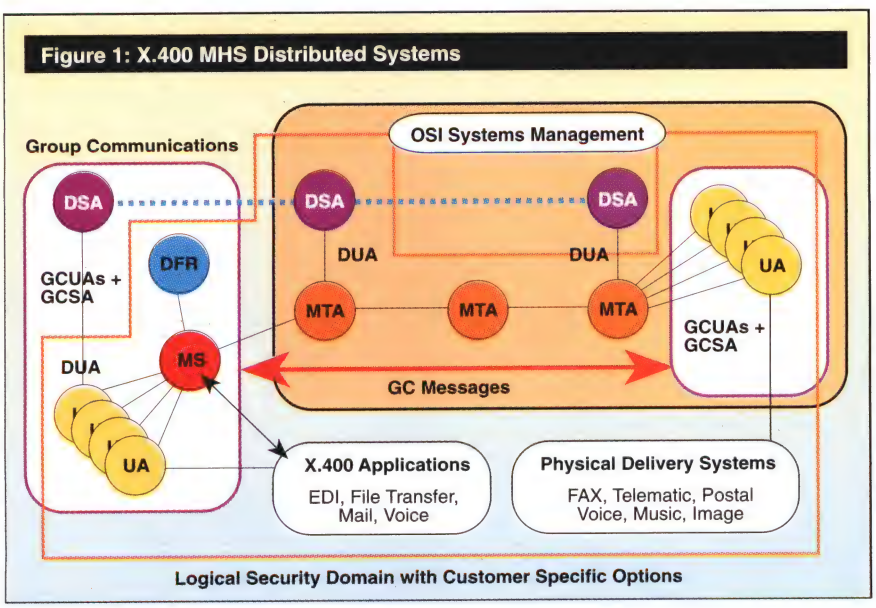
MHS Management

MHS management has been evolving over the last five years. When fully defined, its functions will supplement the 1992 version of X.400 and will be input to the 1996 version. There are a number of levels of management for MHS standardisation. These relate to the TMN (System) level, the MHS management functional/information level (e.g. the managed objects within MHS components) and the interworking functions such as route/capability publishing that have to occur between MTAs and messaging domains. The TMN/X.400 related standard is X.4MMA (ISO DIS 11588-1) 'MHS Management — Model and Architecture.' This document provides an abstract management framework for MHS organised on the five TMN levels of system management, as defined in ITU-TS M.3010 and last month's *OSI Tutorial*.

From the top down, the levels are the Business Management Layer, Service Management Layer, Network Management Layer, Network Element Management Layer and the Network Element Layer.

The Business Management Layer contains business contract, billing and settlement and security management. The Service Management Layer contains contract management, accounting management, help desk and security management functions. The Network Management Layer contains

Figure 1: X.400 MHS Distributed Systems



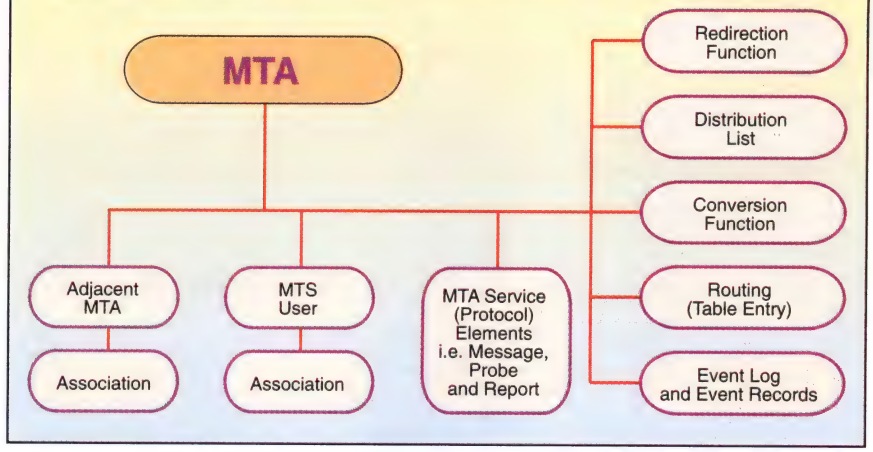
configuration, fault, performance and security management functions. The Network Element Management Layer contains things such as MTA, UA, MS and Access Unit (AU) control points, which are the points of management within a network element. The Network Element Layer contains the actual MHS entities — MTA, UA, MS and AU.

There is no significant alignment of these items in each layer. For example, an event notification from an MTA (Element Layer) can be passed through to fault management (Network Management Layer), to the contract management and help desk (Service Layer) and then into the business contract function (Business Layer). All these functions are related to an architecture which essentially organises the MHS management functions into a hierarchy.

At the lowest layers of this hierarchy are the network element management and network element layer. The draft standards available at this level are: X.4MMI (ISO CD 11-588-2) 'MHS Management — Part 2: (Management) Information;' X.4AMF (ISO CD 11588-3) 'MHS Management — Part 3: Accounting Management Functions;' X.4-MTE (ISO CD 11588-8) 'MHS Management — Part 8: Message Transfer Agent Entity;' X.4UAE (ISO SC18/4/N2447) 'Working Document — User Agent Management;' and X.4MSE (ISO SC18/4/N2444) 'Working Document — Message Store Management.' These documents define the managed objects within the MHS components. Figure 2 shows the types of managed objects within an MTA. These definitions include those managed objects needed for a MTA to interwork with other MHS components. The MTA Managed Object (MO) is the highest point of the definition tree. No other objects can exist without the MTA object, as they inherit attributes from it. The MTA MO contains attributes that record MTA input and output statistics (such as message count), its addresses and optional security labels.

Below the MTA MO are the objects that relate to the other MHS components attached to this MTA, namely, another MTA and a MTS user. The MTS user MO, for example, contains attributes that define the addresses, the user type, message deliverability parameters, submission and delivery control parameters, such as message size and priority. These objects have subordinate association MOs that allow the connections to this MTA to be managed. The 'messages' that are stored and transferred by the MTA are also represented by managed objects (Message, Probe and Report). These objects can provide the management system with information on each message processed by the MTA such as the message's protocol parameters. Other managed objects assist the transfer functions of the MTA. A redirection MO exists if the MTA can perform redirection of messages, and this function needs to be controlled by the management system.

Figure 2: Message Transfer Agent Managed Object Types



The Distribution List (DL) MO relates to the directory interworking function of distribution list expansion. DL expansion is where an MTA takes a 'directory name,' such as 'marketing,' and expands this into a list of X.400 recipients. It does this using the X.500 directory service. This DL MO allows the DL process to be controlled by the management system. The conversion MO defines the conversion functions available within the MTA such as text to telex or fax.

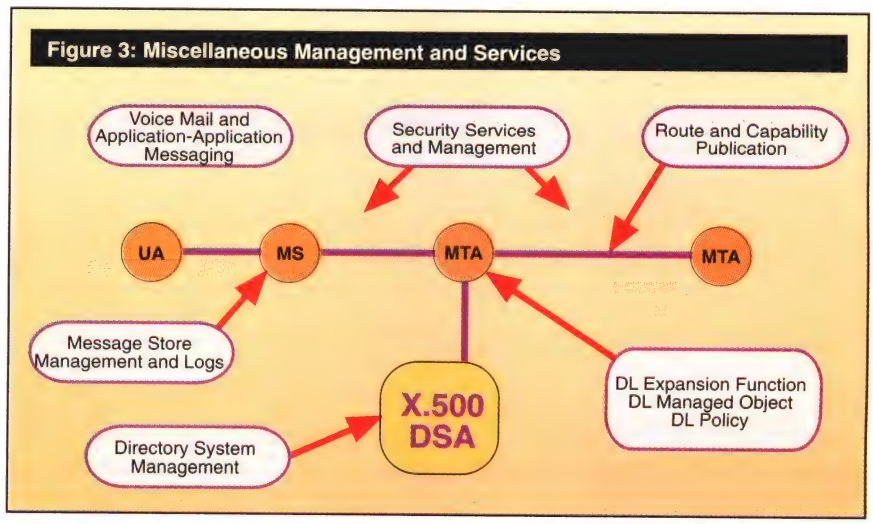
The routing MO defines a managed object which represents the information used in the MTS routing standard (ISO 10021-11, MTS Routing). These objects represent MTA route table entries and MTA capability indicators. The event log managed object gives the MTA a managed logging capability. Logs can contain log records that record events generated by other managed objects (such as a message MO, an association MO or a security/accounting record).

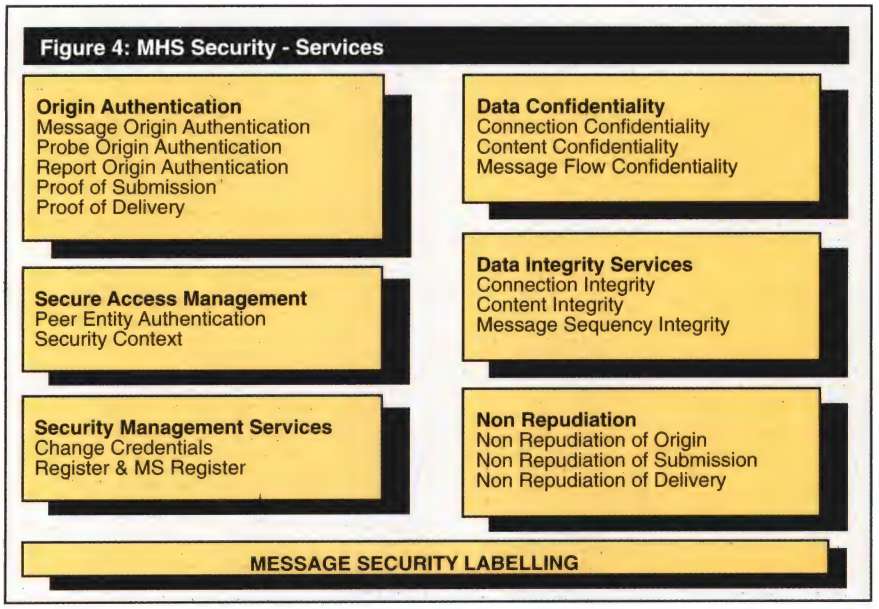
The MHS accounting management standard defines the model that enables the collection of log records for processing within a billing system. It defines the model and interface between the managed objects that represent MTA usage (e.g. a message transfer) through to the customer (the MTS user) via the accounting/billing system. This standard imports definitions from the ITU-TS D.36 standard which defines the structure of resource usage records that are transferred between administrations (the carriers). All the managed objects as described are defined in line with the X.700 series of systems management standards. The other aspects of MHS management (and new services) are really a collection of parts related to different areas of the MHS. Figure 3 positions such features.

MHS Routing

The MHS routing standard defines the model and information syntax for MTAs to publish route and capability information. This is essential if MTAs are to dynamically deal with configuration changes and faults. The information is termed primary and secondary Route Indicators (RIs). Primary RIs indicate the ability of an MTA to directly deliver messages. Secondary RIs indicate indirect delivery capability via this MTA. The information contained in the RIs is the O/R (originator/recipient address) range of the MTA, reachability, route segment attributes (e.g. X.400 84/88 compatibility, max-

Figure 3: Miscellaneous Management and Services





imum message size, application context, etc.), address filters, application title and capability (whether it can copy, convert, defer, etc.). This standard also permits the use of the X.500 directory as a publication mechanism for the route information.

Message Store Logs

There have been a number of major changes to the Message Store standard which allow the user to manage the messages and reports contained by the MS. They enable automatic correlation of messages, sorting, correlated message report generation, automatic actions and message trace logs. These mechanisms will be tied to the management system via MO definitions provided in the MS management standard X.4MSE ISO SC18/4/N2444 — Working Document — Message Store Management.

Voice Mail and Application-to-Application Communication

The voice mail standard for X.400 (X.440) has been available for some time. Voice mail can either be transferred as a message body part or message content. One major aspect of voice mail is that it permits the encoding of the O/R address to be digitally encoded voice (G.721 ADPCM). This may cause a few headaches for MTA routing and routing table sizes, and may result in hundreds of route table entries for one recipient because it has a variety of 'ums,' 'aarghs,' coughs and sneezes embedded in it!

There is a draft document for application-to-application messaging. However this document may not survive, as it can be embraced by the services already specified within the MHS.

Distribution Lists

The distribution list expansion function is contained within an MTA and interfaces to the services of X.500 directories. Associated with the DL function is the DL managed object and DL policy mechanisms. The DL MO has been covered above. The DL policy is defined to influence what happens to the message when DLs are expanded and what happens when and if reports are received from those recipients contained in the 'expanded' message list.

For example, the DL policy can enforce a message priority different to that specified by the originator, can return non-delivered reports to the DL owner instead of the originator, set conversion and disclosure parameters, etc. This permits the owner of the list (rather than the message originator) to control what happens to messages destined for that list.

X.500 Directory System Management

This area of standardisation is in its infancy, but it can draw on the TMN, OSI systems management and X.400 management standards and methodologies. Contributions are being provided to define DSA entry and user management, directory policy management, statistics, configuration and alarm reporting (fault) management.

MHS Security Mechanisms

The 1984 version of X.400 did not provide any explicit features for secure operation. The 1988 version of X.400 considerably enhanced MHS functionality in this area. The additional security features were additions to the actual messaging parts of the protocol and additional security capability in the MTA functions. The control of the function can be provided by the MTS user or the administration of the MHS.

The three basic requirements of message security are message integrity, confidentiality and non-repudiation. These requirements are met by X.400 by providing a range of services which are supported by the various X.400 protocols, functions and message labelling — the message labelling providing the ability to transfer encrypted messages and digital signatures. Figure 4 shows the security services of X.400 MHS. To support the application of security services to the MHS, three levels of security have been specified. The first level is end-to-end security, where only the UAs are involved. The second level relies on support of the UA services, such as message labelling, from the MTS (MTAs). The third incorporates considerable security functionality within the MTS, such as verification of the MTS users via security classification and performing non repudiation services.

Coupled with each of these three levels is the option to request message content confidentiality. The MHS protocol parameters which support the security services on a message basis include the ability to specify security on a recipient basis, digital signatures, non repudiation, encryption, policy, and privacy. How these services are used and applied is up to the product implementor and the user of the MHS. Because the MHS can process the security aspects of a message on a per message or per recipient basis, some level of management interaction between the users of the MTS and the MTS itself is required. Typically these interactions provide the MTS with the information relating to the users' security environment.

Services such as register and control plus the association services (which are used to connect to the UAs to the MTS, etc.) are used to provide such security management mechanisms. The names of the respective entities (for authorisation) and security keys are exchanged. The keys are used by the MTS to verify a specific user has submitted or has received its message. Where a UA registers its security key on association with the MTS and then receives a message which has that user's address and a matched key, the user cannot at some later time deny that message has not been delivered.

X.500 directory services can independently play an important security role in the storage of authorisation information and key management. These services are not totally coupled with the MHS standards, but a standard directory would be the choice for storing security related information. The standards also promote the use of the directory for a third party verification mechanism — again, use of such functions would be up to the product designers. The management standards for MHS also included log records to record secure messages and the security environment parameters in which they are processed.

MHS Evolution

MHS has evolved dramatically since 1984, and the X.400 standards are now the fastest growing set of standards available, probably indicating the level of commercial investment in such technologies. So in reality, if one is installing a 'global' or 'enterprise' messaging system, there is only one choice. *Note: this discussion has been based on draft standards.*

Alan Lloyd

LAN VIEWS

Straining Collapsed Backbones

Graeme Le Roux

When a network gets large enough to require more than just repeaters, simple economics dictate the use of chassis-based hubs. The resultant topography has come to be known as a 'collapsed backbone' or 'backbone in a box.' The first sign that a network has become large enough to require this approach is traffic on the existing system backbone approaching the backbone's practical maximum capacity in spite of all attempts to limit the network traffic transmitted — i.e. tuning address caches, workstation packet buffers, scheduling e-mail transfers, etc. Once this happens you have to add more backbone paths, either copper or, preferably, fibre, and buy a chassis-based hub.

Since your network is a growing concern you look for a chassis with lots of slots and a fast backplane which will, with the periodic addition or upgrade of modules, meet your needs for considerably longer than the device's payback period. The catch is that the fact that the hub you are looking at has more slots and a spec sheet which claims gigabits more bandwidth than its competitors does not mean that it is either the fastest or the most flexible unit that you can buy.

Firstly, look at the wording of the spec sheet; that gigabit bandwidth is an aggregate number. High-end chassis-based hubs have, of necessity, multiple backplanes — sometimes over a dozen. These may be referred to by marketing name(s) like network channels, segment backbones, management buses, Ethernet segments, etc. Whatever they are called they are not connected to anything but the power supply — the big number on the spec sheet is actually the sum of the bandwidths on all these backplanes, often including the management bus which has nothing, directly, to do with shifting your network traffic about the box. Furthermore, these individual backplanes may be dedicated to particular types of traffic — for example FDDI, Token Ring and Ethernet. In some cases you cannot assign, say, Ethernet traffic to a Token Ring backplane. This means that if you have an Ethernet-only network only those backplanes which can be assigned to Ethernet traffic are available to you.

". . . the fact that the hub you are looking at has more slots and a spec sheet which claims gigabits more bandwidth than its competitors does not mean that it is either the fastest or the most flexible unit that you can buy."

Consider a hub which has four Token Ring backplanes of 160Mbps each, four Ethernet backplanes of 100Mbps each and four FDDI backplanes of 200Mbps each, along with a management bus of 64Mbps. The aggregate bandwidth of the unit is 1,904Mbps, or almost 2Gbps in 'marketese,' but if you only have Ethernet you cannot physically use more than the four Ethernet backplanes — aggregate bandwidth 400Mbps — and one extra backplane, say one of the FDDI ones at 200Mbps, therefore the effective aggregate bandwidth of your hub is just 600Mbps and you need four bridge modules (Ethernet-to-FDDI backplane) to do that. Assuming two Ethernet concentrator modules (to which you connect a single floor of your building) per backplane (i.e. total of 8 in the hub) and four bridges (i.e. one from each Ethernet backplane to a common FDDI backplane) plus a single management module of some kind, you can only put a total of 13 modules in the hub unless the backplane is upgraded at some future date — so why did you buy a 15 slot hub? With the possible exception of more modules to, for example, handle wide area links there is no way you can expand your hub unless you deploy more media types in your LAN. Doing that would simply complicate management and administration — remember when you sold the powers that be 10Base-T over Category 5 UTP so you could hook up everybody on just one type of cable system? Another interesting catch is that some hub modules require more than one slot. If the bridge modules in the hub I've described above were to require two slots each you would have to remove two modules or one bridge from your configuration because you would be short two slots in the configuration I've described.

So, having sorted out the realities of physical configuration let's look at the path bandwidth within the hub. The path bandwidth is the bandwidth of the path which a packet will travel within the hub. In the example I've used above, a packet entering the hub on one backplane and which is destined for a network address on another comes in one port, is transferred by a bridge to the FDDI backplane and then again, by a second bridge, to the destination backplane. Assuming that the Ethernet concentrator modules and the bridges are so fast that the latency across them is negligible, then the path bandwidth is limited by the lowest bandwidth backplane in the path the packet follows, which is 100Mbps on the Ethernet backplane.

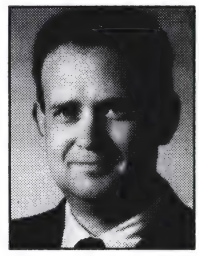
Since every path through the hub's backplanes is as I've just described, the effective maximum bandwidth you can get out of your hub is just 100Mbps or just over 5% of the 1.9Gbps you have paid for. If a substantial percentage of the traffic in your hub is between concentrators on a single backplane or between ports on a single concentrator then, again assuming the latency across port modules is effectively nil, your effective path bandwidth is 10-Mbps. This is just what you had before the hub, but with less nodes on the network. It is also important to understand that the latency across hub modules is non-zero, especially for bridge and router modules in a multi-protocol environment.

Now an effective bandwidth of 100Mbps is still better than you had before the hub and it is hard to overload, although you can do it the same way you did it to your 10Mbps system — just put too many nodes on one backplane. Let's assume that the traffic in the network I've described is evenly distributed — which is a large assumption. Recall that the reason for purchasing a hub was traffic increase, so let's say that the old system had reached sustained 20% average bandwidth usage — at which point Ethernet slows down perceptibly — therefore our eight concentrator modules are accounting for 2.5% each. We have two concentrators on each backplane so the traffic on that backplane is roughly 5% of the original system capacity. This means that, bridged traffic aside, the network traffic on any one backplane would have to quadruple before you were back at 20% load. Notice that ten times your old maximum bandwidth (100Mbps as opposed to 10-Mbps) does not give you ten times the network capacity and, perhaps most important, you have achieved a massive increase in capacity with just 100Mbps worth of hub bandwidth; so why did you need to buy a 1.9Gbps whiz-bang hub?

Graeme Le Roux is a Director of Moresdawn Pty Ltd (Bundanoon, NSW) and specialises in local area network consulting services.

INTERNETWORKING

All Quiet on the SNA Internetworking Front



Robin Layland

The sabres have stopped rattling and are back in their sheaths. The battle to control industry standards for SNA internetworking finally has ended. All factions have decided to give peace — and IBM's Data Link Switching — a chance.

The recent agreement among router vendors to use Data Link Switching (DLSw) as the baseline standard for transporting 3270 SNA traffic over internetworks is a welcome surprise for corporate networkers. A year ago, everyone was hunkering down for some long-term trench warfare on the SNA internetworking front. Cisco Systems and IBM were trading rounds over APPI and APPN, while other vendors were mobilising proprietary methods for encapsulating 3270 traffic in IP packets.

All that posturing and maneuvering came to a sudden end in April, when IBM and Cisco announced at an IBM-sponsored APPN implementer's workshop that they had agreed to back DLSw as an open standard for SNA internetworking. Several other router vendors immediately leaped to the microphone to announce DLSw deployment plans. By the time the workshop was over, the new internetworking buddies had formed a group that is now refining DLSw for submission to the Internet Engineering Task Force (IETF) for formal approval. So what if the whole episode had all the planned spontaneity of a faith healer's tent revival — the bottom line is that vendors aren't going to waste their time and users' money battling over who gets to set de facto standards.

DLSw's chances for success are strong. About 30 vendors — including most leading makers of routers and standalone SDLC conversion gear — have said they are at least willing to consider DLSw as an industry standard. Some already have announced timetables for DLSw deployment: Wellfleet plans to graft DLSw support into its products soon, while Proteon expects to be DLSw-ready early next year. Cisco says it will implement DLSw by mid-1994.

Of course, the pessimists in the crowd will point out that DLSw's apparently universal adoption doesn't mean that all problems relating to SNA internetworking will disappear overnight. After all, an approved standard isn't likely until early 1994, which means products that appear before then could have interoperability problems. Even after the dust has settled, DLSw may end up serving only as a least common denominator for handling SNA traffic over internetworks, which means vendors will have plenty of chances to put proprietary fingerprints on SNA internetworking technology. And the current version of DLSw has a few glaring shortcomings that need to be addressed in the near future.

But let's put all the negatives aside — at least for a few paragraphs — and accentuate DLSw's positives. Data Link Switching, which made its debut with the 6611 multiprotocol router, is IBM's architecture for carrying 3270 SNA and NetBIOS traffic over internetworks built with multiprotocol routers. A special technique is needed for handling this traffic because 3270 SNA and NetBIOS are unroutable — they don't contain routing information in their addresses.

In essence, DLSw takes SNA traffic and makes it ready for efficient transport over wide area internetwork links. It encapsulates 3270 SNA and NetBIOS in TCP/IP, mapping SNA and NetBIOS sessions to TCP/IP addresses. It defines how LLC2 (logical link control 2) sessions are terminated at one LAN and restarted on the other side of the network. (LLC2 carries 3270 sessions over Token Ring LANs.) Along with handling the unroutable SNA protocols, DLSw cuts network overhead by caching names and converting broadcast messages into directed messages. It defines how SNA's SDLC (synchronous data link control) traffic is converted to LLC2, as well as how APPN traffic is encapsulated in TCP/IP.

Now, back to those shortcomings. The group that's preparing a DLSw proposal for the IETF has identified seven areas in which the IBM scheme needs improvement. These areas are flow control, connectivity, loop prevention, SNMP support, feature identification, conformance testing, and prioritisation. Within the main DLSw group, subgroups have been set up to address each of these seven areas. Right now, DLSw doesn't support all the possible parameters and configurations that could be present during 3270 session establishment. Until all connectivity options are covered. DLSw won't be able to guarantee that all SNA traffic will be moved to internetworks. Network loops are a potential problem because DLSw was designed for source routing, while Ethernets use transparent bridging. DLSw routers need to be able to participate in the transparent bridging spanning tree to ensure that they don't create an endless network loop when they are inserted in a network containing transparent bridges.

IBM's original DLSw proposal has no provisions for network management. An SNMP management information base (MIB) for DLSw is now in the works. As for feature identification, communicating devices need a way to let one another know which parts of the DLSw standard they support, since not every DLSw device is going to implement everything in the standard. Similarly, conformance testing is needed to ensure that products actually follow the DLSw standard.

Of the seven problem areas, the one that's probably the toughest to crack is prioritisation. The goal is to bring to router-based internetworks the kind of prioritisation that's provided in SNA's Class of Service scheme. The prospects for this happening under DLSw aren't great, however. The more likely scenario is that priority and Class of Service routing will be developed for DLSw traffic but not extended to other traffic on the internetwork — which means it will be a waste of time. And there's one more important issue that internetworking vendors have yet to address: scalability. It's a potentially sticky issue under DLSw because routers must conduct TCP/IP sessions between themselves to exchange routing information and the like. Under DLSw, a branch office router connected to a network of 100 other routers would have to maintain 200 TCP/IP sessions (one for sending and one for receiving). Another scalability issue concerns the size of routing tables maintained by DLSw routers. DLSw routers keep tables with the locations of SNA and NetBIOS devices. The larger the network, the larger the table.

Vendors say they are aware of these scalability problems, but the DLSw development group isn't taking any action. Unfortunately, what's likely to happen is that vendors will address scalability on their own — as Cisco and Proteon have hinted. This could mean that interoperability between DLSw routers will only be achieved at the lowest level. Then again, maybe vendors will get around to scalability later. A reason for version 2 of DLSw is needed, anyway.

Robin Layland is a consultant based in the US specialising in internetworking and SNA.

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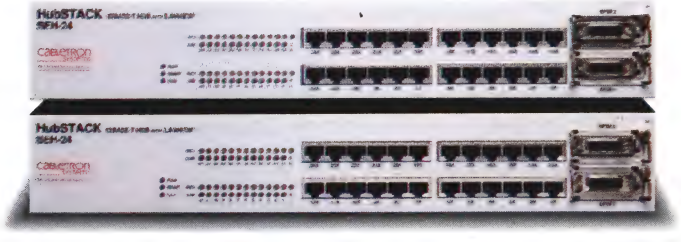

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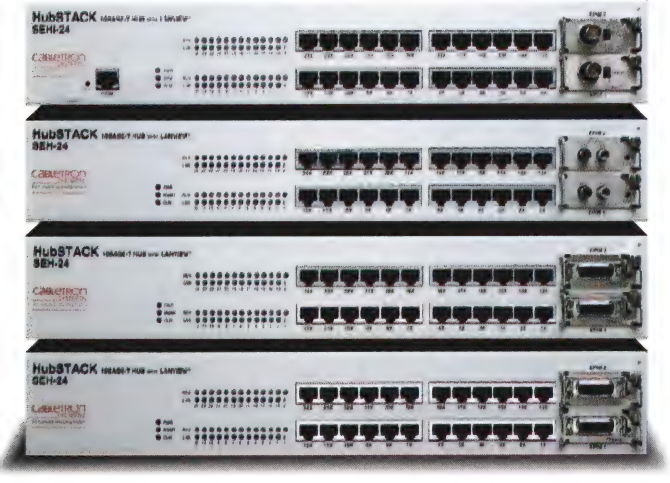

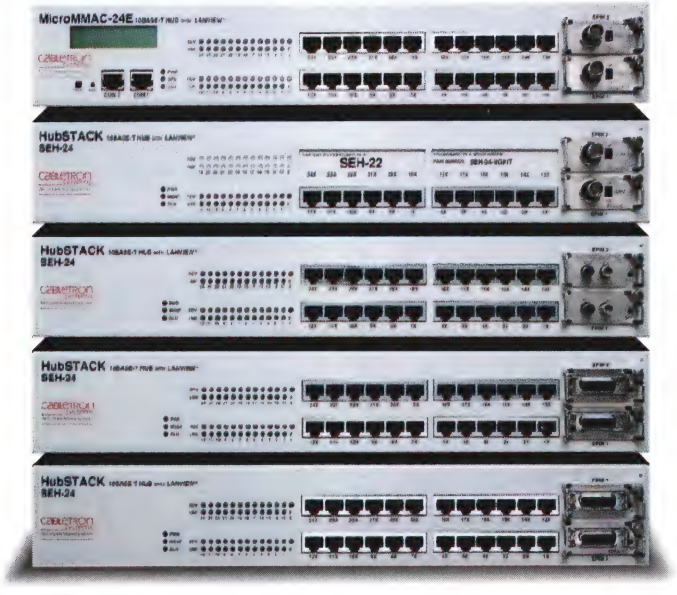

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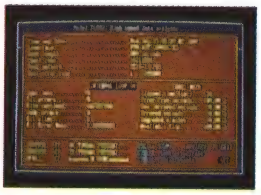

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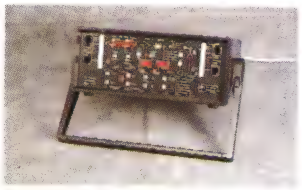

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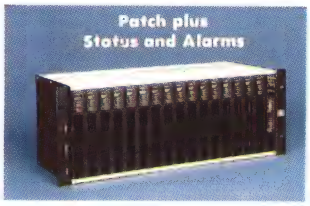

- Circuit switching and PATCHING.
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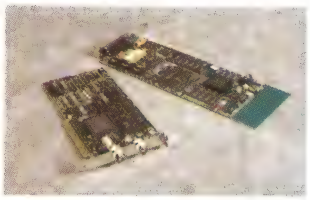

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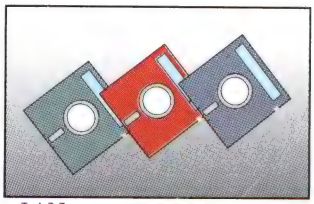

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NetComm's Electronic Secretary

NetComm's new combination of hardware and software can look after your calls, faxes and incoming data while you're away from the office.

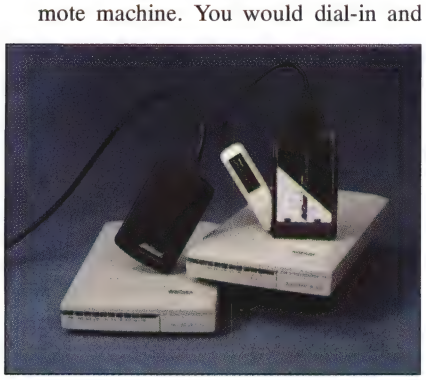
Call-diversion, fax back/fax broadcast, paging and message recording/voice mail are all valuable new telephony functions that can be supplied in three ways: by the carrier through the local telephone exchange; by a third-party value-added supplier; or by you at your own desktop or PABX. Each approach has some advantages and disadvantages — in terms of both functionality and cost.

NetComm's new Electronic Secretary aims to provide a desktop solution for PC users — particularly those in small companies. This modem-software combination consists of a voice-capable fax-modem (a refined SmartModem V8 or V6 and AutoModem V8 or V6), and the new Cooee software Communications Manager — total price from $1,500 down to $600, all up. You'll need a decent sort of PC with at least 10MB of free disk space as well.

The four NetComm data/fax modems are the standard-but-sophisticated V.32*bis* models with transmission rates up to 14.4Kbps. They include the CCITT V.42*bis* (plus MNP5) data compression protocol which switches in only for data transmission.

The most important services provided by the Electronic Secretary are:

- It acts as an answering machine with voice announcement and message recording (on hard disk);
- It can play-back any recorded voice messages when instructed to do so from a remote location, on-line, by using tone-phone signalling and PIN security. Message delivery can be programmed to happen automatically at set times to various phone numbers, or can be triggered by a dial-in command only. You can also change the response pattern by remote control;
- It can record incoming fax communications, and play back these faxes to a remote machine. You would dial-in and provide both your PIN and the redial-number of the remote fax. The Electronic Secretary will then fax-back your messages after you hang up;
- It can also record incoming data, and play it back to a remote PC in the same way — so it can store and divert e-mail as well as larger files;
- It provides message-forwarding to your pager or cellular phone. You can program the Secretary to dial a preset number after receiving a voice, fax, or data message and deliver an appropriate pre-recorded voice-message;
- It allows your customers to receive 'Fax-Back' information directly from your machine. Tone-keys are used to allow customers to select from a menu of fax delivery possibilities; and
- It will also perform on-line, real-time call diversion, provided that your PABX can handle it.



To be able to conduct this wide range of voice-response transactions, the Electronic Secretary must be able to select intelligently from a range of pre-recorded options. It does this in two stages. First, the modem will identify the call as being voice, data, or fax, and deliver this information to the software. Then the software will take over and respond according to the script.

The script can be formulated to immediately react (as with fax and data recording), or to ask the caller to select from menus using dial-tones, and each of these selections can have an appropriate voice-response. Additionally, the response options can vary according to the time of day.

A Boon For Small Business

The main modification NetComm has made to its modems for Electronic Secretary use is the inclusion of the new MNP10 protocol which provides 'fall-back' rates if lines are noisy (and 'fall-forward' when they are not), and a new in-built fax/data/voice 'blitzer' switch which listens for the fax/data identification tones and controls the use of the voice coding and compression circuits.

So that voice data can be handled by the PC, there's analogue/pulse code modulation (PCM) conversion which translates between 3.5kHz analogue and 64Kbps digital voice, and some 'adaptive differential' (ADPCM) technology which reduces the digitised voice stream to a more manageable size for disk storage. You can pre-record your own 'play-back' messages and also store incoming voice-mail on the hard-disk — as long as you've got enough free disk space — but don't forget that voice is a great space grabber.

PRODUCT SUMMARY

Name: NetComm Electronic Secretary

Description: A hardware/software combination which provides a range of electronic messaging services including voice mail, fax back, paging and answering services and a message processing system

Price: From $600 to $1,500

Vendor: NetComm (Australia) Pty Ltd, Block A, 25 Paul St North, North Ryde NSW 2113 Tel: (02) 888 5533

Most of the smarts are, of course, in the Cooee software, which runs in Windows (you'll need an 80386 machine with 4MB of RAM at a minimum). NetComm says it will shortly be releasing a Mac version.

The initial set-up process is a relatively straightforward, mouse-and-icons operation. Short script modules need to be selected from a library (or written) to customise the various sequences of response. The reaction-options are entirely customisable, and so branching 'decision trees' can be quite complex and extensive, or simple — it's your choice.

There are only four minor criticisms of the Electronic Secretary. The first is that it only responds to tones — and, despite years of warning, Telecom has continued to use pulse-dialling on new installations, so Australia has lagged behind the rest of the world.

Secondly, the PC needs to be left running in an unattended office, and in lightning-prone areas this could be a bit risky. Thirdly, users will need a fair amount of clear disk space on their PC, and the ADPCM chips used don't compress the voice all that much. However, cheaper CELP compression should be available soon.

The final criticism is along 'all-the-eggs-in-one-basket' line; that a disk crash or other PC problem could result in the loss of all forms of communications at once, which could be rather devastating for businesses built around the Electronic Secretary's functions. But, of course, businesses would only do this if they have found the product to be extremely valuable — and it's my guess that many small companies will.

Stewart Fist

SynOptics' New Hierarchical Hub

The SynOptics System 5000 high-end LAN hub has been built from the ground up to oversee other hubs located remotely.

Until now, establishing a single point of connection for LAN hubs distributed across a campus meant configuring one of the boxes as a so-called hub of hubs. Simple? Yes, but hardly an effective approach to network management — LAN hubs are primarily designed for desktop connections. Using them as internetworking nerve centres is expensive and inefficient.

SynOptics Communications thinks net managers have enough on their minds without having to make do with near-miss technology. Its System 5000 — the vendor's third-generation product — is designed to be right at home at the heart of a network of distributed hubs. The System 5000 is a highly-flexible modular hub architecture that is capable of providing over 12Gbps of system throughput. Each hub can provide connectivity and core network management capabilities for up to 52 Ethernet segments, 26 Token Rings or five FDDI rings. From its central location in a computer room or data centre, the 5000 can tie into (smaller) System 3000 modular units and (even smaller) System 2000 stackables that have already been deployed.

System 3000/2000s can be located up to two kilometres from the central hub. They communicate over fibre cable linked to so-called cluster modules that slot into the 5000. Each cluster module can support four Ethernet or two Token Ring segments on a single board. Each ring or segment cluster supports a fibre interconnect port and three to four copper host ports. When multiple cluster modules are used, the System 5000 can become the single point where each segment or ring meets at one physical location, and multiple System 5000 hubs can be connected to each other to increase the number of segments supported by the overall system. Network managers dictate which hubs can exchange traffic by issuing commands from a console loaded with version 4.0 of Optivity, the SynOptics management software.

Remote hubs which are connected to different cluster modules can reach each other via the System 5000's backplane buses. Remote units linked to the same cluster module swap packets over the latter's internal bus — thus freeing up backplane capacity and improving overall LAN performance.

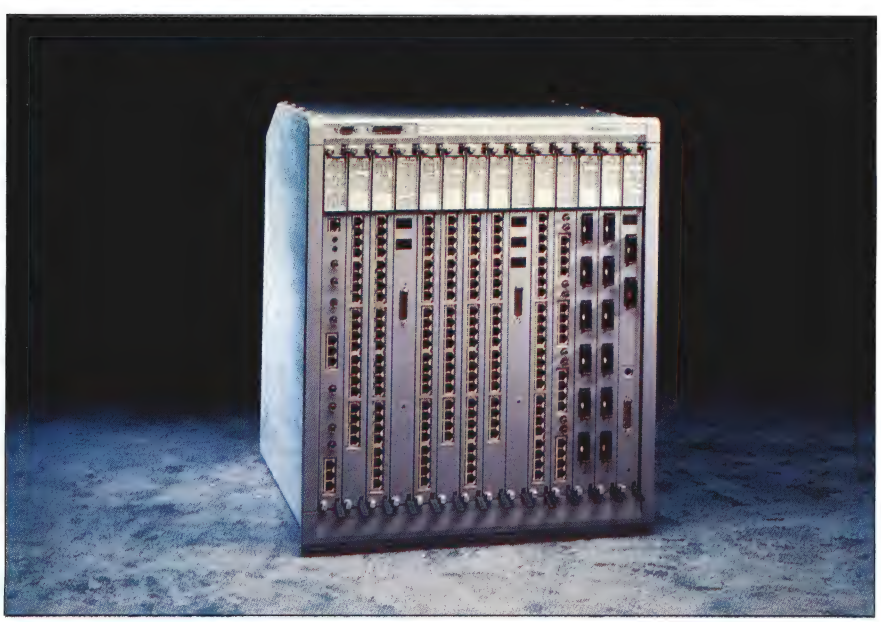
Cost Savings

Before the System 5000 came along, network managers used System 3000s to get the same job done. SynOptics says that its new unit delivers four distinct advantages over the old way of doing business.

Firstly, the cluster modules allow the 3000/2000s to be linked for far less money. Second, the cluster modules can accommodate more port connections, so a System 5000 can support more remote hubs while taking up less space in the computer room.

One System 5000 equipped with five cluster modules, for example, could be used to manage 20 Ethernets at a cost of $87,200, including one net management module. Four System 3000s would be needed to support the same configuration, at a total cost of $117,140. (Space savings become more advantageous in proportion to the complexity of the network; it would require 10 System 3000s to handle the maximum of 52 Ethernets a single System 5000 can oversee).

Third, the System 5000 allows users to set up connections in software, rather than having to physically configure the hardware in the wiring closet. Finally — in order to make it easier to oversee complex, distributed LANs — the System 5000 can be set up to report different levels of network management information, from basic performance statistics all the way through to protocol analysis.



PRODUCT SUMMARY

Name: SynOptics System 5000

Description: A high-end LAN hub that supports Ethernet, Token Ring and FDDI network connections. Designed to serve as a central hub for remote SynOptics System 3000 and System 2000 hubs

Price: Chassis costs $4,940 to $7,915; supervisory modules cost $1,985; management modules start at $10,680; 6-port FDDI modules cost $15,430, 24-port Ethernet modules cost $9,095; 24-port Token Ring modules cost $8,895; Hot-swappable power supplies cost $1,985

Vendor: SynOptics Communications

Distributor: Com Tech, Unit 5, 37-41 Doody St, Alexandria NSW
Tel: (02) 317 3088

ATM Plans

The System 5000 has got something else going for it as well. Next year, SynOptics plans on launching an ATM backplane upgrade, as well as modules for ATM (155-Mbps), switched Ethernet (10Mbps), and switched Ethernet/Fast Ethernet (10/100-Mbps). At that point, users will be able to migrate easily from shared-media LANs to switched, dedicated-bandwidth topologies, according to SynOptics.

The System 5000 is a 14-slot chassis. The hub's cooling system, redundant power supplies, and system management module are all incorporated into the back of the unit; consequently, they don't take up valuable

slots. All the hub's components are hot-swappable.

The hub is available with three different backplanes. The first supports 12 Ethernet networks; the second simultaneously accommodates 12 Ethernets and nine 16Mbps Token Rings. The third adds five 100Mbps FDDIs to the mix.

SynOptics has announced a number of modules for the first release of the System 5000. Two cluster modules are available. The Model 5378-F supports four Ethernet 'clusters,' each consisting of one fibre port, which supports an Ethernet connection to a remote hub, plus four RJ-45 copper ports, which are used to connect the hub to locally attached equipment — like bridges, routers, and servers — in the network centre.

The Model 5575-F furnishes two Token Ring clusters. Each features a pair of fibre ports, which are used to support a 16Mbps Token Ring ring-in/ring-out connection to a remote hub, plus three RJ-45 sockets.

Among the other modules that have been announced are ones that furnish a maximum of 24 Ethernet or Token Ring ports to PCs attached locally over UTP (unshielded twisted pair). Both two and six-port FDDI modules have been announced.

All modules can be isolated from the hub backplane (to create independent LAN segments) either by setting a switch on the chassis or from a central console running the vendor's Optivity software. Modules can also be assigned to any of the LAN backplane segments in the chassis, thus enabling them to communicate with cluster modules and attached equipment.

Management 101

The System 5000 offers two levels of net management. In the simpler mode, all of the network modules in the hub send statistics (such as network utilisation) to a Model 5310/5510 management module, which forwards them to a workstation loaded with the SNMP-compliant Optivity package. The connection between the network modules and the management module is via a dedicated 32Mbps internal Common Management Bus (CMB). The link to the console can either be in-band over a LAN connection or out of band via a dial-up line.

in the more detailed mode, the management module is helped out by Data Collection Engines, daughterboards dedicated to monitoring a single Ethernet or Token Ring on the chassis backplane. The Data Collection Engines gather a greater range of diagnostic data and pass it to the console, which uses it to display decodes and build network maps (among other features).

Each network management module can be equipped with either two Token Ring or three Ethernet Data Collection Engines. Users must thus carefully weigh their need for network management against their requirement for network capacity, since every network management module added to the chassis reduces the number of possible network connections.

As noted, the System 5000 can accommodate a maximum of 52 Ethernet connections (13 cluster modules and one management module), or 26 Token Ring connections (13 Token Ring cluster modules plus one management module).

SynOptics is planning to offer switched LAN modules for the System 5000 by mid-1994. These will include a two-slot ATM switch and a one-slot Ethernet switch that delivers 10Mbps of dedicated bandwidth to each network node. Also on the way is a one-slot switch that dedicates 10Mbps of Ethernet bandwidth to ordinary nodes and 100Mbps of fast Ethernet capacity to bandwidth-hungry nodes like servers and high-end workstations. A Token Ring switch also is planned. The conversion between ATM cells and conventional LAN packets will be handled by daughterboards attached to switch modules.

Stephen Saunders

E-Mail For LAN-Attached Laptops

Novell's Remote MHS e-mail software means laptop users don't have to dial-up the LAN from headquarters.

Dialling into Novell's Message Handling System is an acceptable way for remote users to pick up their e-mail when they're on the road — acceptable but slow. So the last thing weary business travellers want to hear when they've hauled their laptops back to headquarters — and that speedy corporate LAN — is that they've still got to access the mail server via a dial-up line. Unfortunately, that's been business as usual for far too long.

Novell is looking to make things right: NetWare Remote MHS 2.0 (RMHS) gives globetrotting networkers what they've long asked for — a way to tie laptops, notebooks, and palmtops directly to the network via a LAN adaptor.

This new-found flexibility means net managers now have the option of eliminating permanently moored PCs for their roving workers altogether, and supplying them with just one machine — a laptop serving double-duty as both a desktop and a remote PC. What's more, RMHS is far easier to install than its predecessor, Novell's MHS 1.5 Personal Edition.

And even when users are out on the road, RMHS gives them something to be thankful for. The new software is optimised for dial-in service, and can work with a number of easy-on-the-eyes graphical interfaces from third-party suppliers.

Visible Difference

Personal Edition was strictly character based, which made it a functional, though hardly fun, travelling companion. RMHS, on the other hand, works with snazzy, icon-based, graphical front-ends from eight e-mail vendors, including Beyond Incorporated and Da Vinci Systems. These products feature sophisticated facilities, such as filters that automatically sort through incoming messages and store them to the correct e-mail folder.

Third-party applications are tailored to run with RMHS using Novell's SMF-1 and SMF-70 application program interfaces (APIs). RMHS acts as the underlying transport mechanism (a behind-the-scenes program that actually moves the messages through the network). Alternatively, the package can run on its own; it's supplied with a DOS interface that users may find more difficult to work with.

Remote MHS also is far easier to install than its predecessor. Setting up MHS 1.5 Personal Edition was a time-consuming, labour-intensive chore. Users had to enter up to eight screens worth of information, including name, password, modem parameters, dialling prefix, phone number, calling card number, tone or pulse dialling, manual dialling, and retry options, before they could begin working with the package.

With RMHS, all this information is consolidated in a single screen setup utility that prompts the user through the installation process to ensure correct configuration.

After RMHS has been installed for the first time, users can continue to modify its configuration to suit different calling environments using command-line options. The product also comes standard with script files, allowing users to dial into public hub services such as CompuServe.

Additionally, users can switch between dial-in and LAN-attached access with a minimum of hassle, because RMHS automatically senses whether the portable is connected directly to the NetWare LAN or is calling in over a phone line. When a user logs onto the LAN locally, a line in the PC's autoexec.bat file (called the mail variable [MV]) is changed automatically, temporarily converting the user to a permanently attached e-mail client. The user is then able to submit and receive messages without interruption.

And according to Novell, unlike Personal Edition, the RMHS code has been optimised to obtain peak performance over dial-up lines. The software will work with any speed of modem, and is compatible with the V.42 error correction algorithm.

PRODUCT SUMMARY

Name: NetWare Remote MHS 2.0

Description: Message handling software that allows laptops and other portables to link via adaptor directly to a NetWare LAN and access the MHS mail server

Price: $190 per licence

Vendor: Novell

Distributor: Com Tech, Unit 5, 37-41 Doody St Alexandria NSW 2015 Tel: (02) 317 3088

Thanks for the Memory

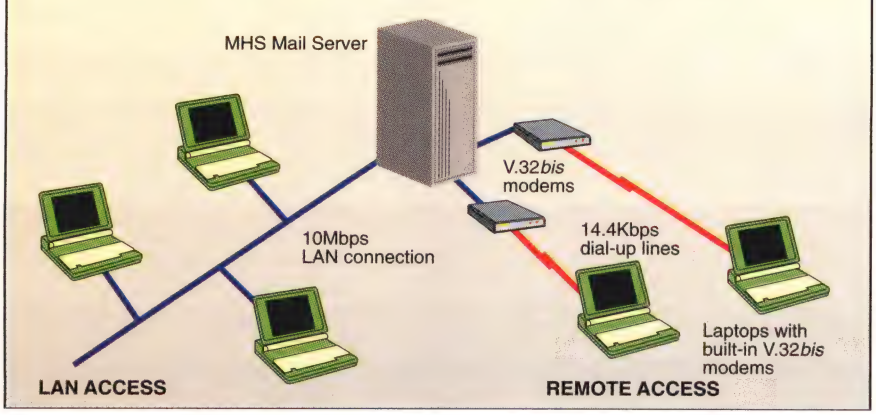
While the earlier Personal Edition package occupies 512K of memory, RHMS takes up just 200K. Novell's new package can either run in DOS memory or (for the first time in a Novell product) as a DOS application under Microsoft Windows or IBM OS/2. The software will play on any XT, AT, PS/2 or compatible portable running DR-DOS 6.0 or DOS 3.1 and higher. The software is supplied on a 3.5-inch diskette and occupies 3MB of hard disk space. RMHS works with any Novell-certified LAN adaptor.

RMHS is able to communicate with two types of MHS mail server: a dedicated PC on a NetWare LAN or a Global MHS server, which runs as a NetWare Loadable Module (NLM) on the LAN server.

Stephen Saunders

E-Mail Software Lets Laptops Do Double Duty

Novell's Remote MHS e-mail package for portables enables mobile workers to use just one portable to collect all their messages. They can connect via an adaptor to a mail server on a LAN when they're in the office or call in from the road over a dial-up telephone line.



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Tom Amos

On the Flip Side

It is only just a short time since Optus began offering limited services in Australia under a regime that created two full carrier licences and a third mobile licence. In that time both carriers have pursued very different market and sales strategies. Telecom, the incumbent carrier, has pursued product diversification, complex bundling and packaging strategies that repackaged basic services under a range of new names with implicit discounts, whilst Optus has sought to introduce simple services and packages with sliding discounts based on volume usage.

It is amazing the inroads that the second operator has made in the provision of long haul telecommunications services in this ever-expanding Australian marketplace. At last count, in some major cities in a little over twelve months, and after a ballot or two, almost one quarter of the higher value traffic has already changed allegiance from one carrier to the other. When set against the traditional growth rate of around 5% this is startling. No doubt heavy marketing and win-back scenarios will swing these figures around, and they will stabilise at some lower figure — or at least I'm sure that's what the carrier marketing departments all believe. The alternative scenario is an unprecedented slide from dominance by Telecom in some areas. So much for all that natural monopoly in telecommunications rubbish that was claimed only a few years back!

Both full licence carriers have competed vigorously, spending tens of millions of dollars to stimulate the overall marketplace for their products. This market stimulation is something that has never occurred before in Australia on such a scale and with such vigour and imagination. The results are self-evident. The general use of the telephone must have increased significantly over the twelve or so months, as the quest for clients intensified — so a larger telecommunications market has resulted. Yet a significant amount of the new traffic (and a lot of the old) has moved, and the magnitude of this slide should be of great concern to all.

If politics is any guide, if you are losing market share it is usually not the brilliance of the other player that is the source of the problem, but your own inability to directly address the market with exactly what is required. In telecommunications, it seems that this also holds true. It appears that the confusion and complexity of the Telecom retail products has meant that Optus' simpler offerings (even though prices are similar after you've cut through all the jargon) are more appealing. Telecom appears to have lost the business rather than Optus winning it — perhaps a reflection of the old monopolist still not understanding its customers' simple needs and requirements. After all, one could argue that if you are in touch with your client base, then your products and subsequent marketing would reflect that, and the resultant competition-based shrinkage would be kept to a minimum. Not so. New US-style products such as the MCI-derived Family and Friends service have been rapidly introduced, transported from marketplaces that are either more specialised or more focused. Australians seem not to want to bother with such complexities.

The user intent of deregulation was to move the provision of telecommunications services into cost-related pricing areas, rather than perpetuate the haphazard arrangements that had developed over the previous decades. This meant that both the telecommunications user and Australian industry would benefit from timely and cost effective service provision. Averaging down of tariffs across the board was an intended consequence, and a CPI-based basket arrangement was developed to ensure that the reductions were actually put in place. What has occurred, of course, is spot competition in various service areas rather than across the board, and this has meant that the majority of services have stayed at the same price, whilst competition has developed in just a few key areas.

The increase in traffic is also having a side-effect on the level of service and the need for both carriers to boost infrastructure spending to handle these increases. Such provisioning is expensive and is sure to put pressure on profitability in the medium term, even without considering the introduction of the pre-emptive commercial plans to re-cable Australia for Pay TV by Telecom. A potential commercial disaster in the making? The Future Mode of Operation underlines the need to continue to spend on this expansion.

Having apparently gone the wrong way in the market, Telecom is now caught in a trap of declining market segment share, increasing infrastructure costs and fixed overheads that must be putting some severe financial pressure on the organisation. The search for hollow logs is on in earnest, although it is unlikely that the business value now reflects the heady monopoly value of only a few years ago, when privatisation was on the agenda.

Introducing liberalisation of the market without privatisation could have been a costly mistake. How long should the Government now wait before correcting the situation and clawing back some of the value that has been lost by not privatising at the beginning? If the market trends continue, by 1997 Telecom may no longer be dominant in a number of key service areas and will also be faced with the potential entry of additional specialised niche common carriers, who will expand the range and breadth of the drive towards cost-related service provision.

It's a sticky situation that has developed at a breakneck pace, and will probably require equally quick decisions by the government if those currently at sea are to be saved. Expansion into new areas and vertical niches, whilst attractive in other markets, really do not address the fundamental health of the business and its market position. They appear to be more reasons to maintain the size of the business, rather than sizing the operation to the core opportunity.

For the first time there is a real risk that world telecommunications history is to be written in Australia, a time when the incumbent carrier became non-dominant in its core business — the flip side of the second carrier's success.

Tom Amos is a partner with telecommunications consulting engineers Amos Aked Swift.

Alex Gosman

Fostering Industry Growth

The year 1994 promises to be the most significant year in the industry policy arena for the telecommunications industry since the selection of Optus in 1991. With the emerging 'Information Age' based on the convergence of telecommunications, computing and broadcasting technologies, one of the fundamental issues will be whether Australia is to participate from a position of strength, not just as a sophisticated user of, but also as a provider of, advanced products and systems, to both domestic users and international markets.

Because of the existing significant productive strengths of the Australian telecommunications industry (high levels of automated plant, a skilled workforce and significant investment in R&D) Australia is in a unique position, in that the emerging areas of opportunity in high technology industries will complement the strengths of the Australian industry. It is industry, through investment, innovation and efficient manufacturing, that will determine whether Australia maximises its opportunities. Government can't undertake these efforts for industry; what it must do, however, is provide a supportive, growth-oriented framework that focuses support on those areas of competitive advantage.

In this context, the various policy reviews and Industry Statements scheduled for 1994 are crucial to demonstrating the commitment of the Government to working in partnership with industry.

Specific policy initiatives in the telecommunications sphere include the investigation by an 'expert panel' into broadband services. The Minister for Communications, David Beddall, has commented that policy recommendations by the panel for capitalising on the industry development opportunities which are identified in the course of the investigation will be an important aspect.

It is also essential that the post-1997 review into the telecommunications regulatory environment be conducted as soon as possible, including the foreshadowing of what industry policies are to apply. A demonstration by the Government of continuity and certainty in its policy approach towards the industry is essential for long-term planning and investor confidence.

As a means of providing the avenue for the input of interested parties into the policy development process, the Australian Electrical and Electronic Manufacturers' Association (AEEMA) supports the proposed re-establishment of the Ministerial Advisory Committee (MAC). The MAC comprises representatives from the major sectors in the telecommunications industry, and can play, in the future, as important a role as it did in 1991 in providing policy advice to the Government.

Whilst the above reviews and studies are specific to the telecommunications industry, two other more general reviews are also of prime importance for the development of policies impacting on this industry. First, there is the existing inquiry by the Industry Commission into research and development. In an industry dependent on innovation for success, the Commission's inquiry is obviously of vital interest.

Secondly, the Minister for Industry, Technology and Regional Development, Alan Griffiths, plans to deliver an Industry Policy Statement in the 1994 autumn parliamentary session. The Minister says the objective of the Statement is to 'set the agenda for Australia's industry policy through to the year 2000 and beyond. It will link the gains of the past decade with the opportunities for the next.'

AEEMA has, in its capacity as the representative industry body for the Australian telecommunications equipment and systems industry, been requested by the Minister to provide input on 'issues regarded as critical to industry development.'

Areas which have been foreshadowed within the Statement of relevance to the telecommunications industry include 'possible adjustments to industry programs and the introduction of customised policies for industry sectors' and the 'use of Government procurement in the overall context of industry policy development.'

Government procurement can play a positive role in enhancing competitive industry capabilities in Australia, by way of, for example providing early demand for advanced new products or services, enforcing stringent product requirements on suppliers, developing Australian-based project skills and supporting investment in innovation.

In the context of a competitive and dynamic business environment the strategic use of Government procurement can provide the framework in which industry and its customers can work together. In the telecommunications industry the demands on suppliers to provide leading-edge equipment for the networks of both Telecom and Optus (and now Vodafone), as well as for sophisticated private customers, have provided the framework that has enabled the industry to significantly increase exports (predicted to be $550 million in 1993, compared to only $80 million in 1989).

The industry development arrangements applying to the telecommunications industry focus on issues concerning innovation, exports, strategic supplier relationships and the integration of Australian industry into international markets (through, for example, encouraging strategic relationships between Australian companies and multinationals based on complementary strengths).

The objective of the various policy reviews outlined above must be to ensure that in the telecommunications sector the Government has a policy framework that enhances Australian industry development. Existing policy approaches have supported the Australian industry in its supply of a range of the most advanced telecommunications products, systems and services to both carriers, business and individual customers at internationally competitive prices.

The reviews provide the opportunity to examine existing approaches in the light of developments and technological changes, with the potential for new initiatives or a refocusing of existing initiatives as required.

Alex Gosman is Executive Director of the Australian Electrical and Electronic Manufacturers' Association, based in Canberra, ACT.

Employees, Consultants and the IT Industry

While critically dependent on the know-how of employees and consultants, most IT companies do a bad job of protecting their interests. Brent Fisse and Peter Waters consider the key issues.

The information technology industry operates in the general environment of employment and industrial relations law. However, there are special risks of exposure to loss which flow from the high staff turnover, the widespread use of contractors, and the extent of access to confidential and proprietary rights.

Employees or Contractors?

The traditional test used to distinguish employees from independent contractors is the extent of control exercised. Under this test, the person hired is an employee if he or she is under the direction and control of the employer as to the manner in which he or she should carry out the work.

By contrast, the person hired is an independent contractor if the engaging party leaves it to him or her to exercise skill to achieve an indicated result in such a manner as he or she determines.

This distinction is often difficult to draw, especially in an industry of high-level expertise: the more skilled the task performed by the engaged party, the less appropriate the control test becomes.

In general, the following factors are likely to indicate that the person hired is an employee:

- Payment of a regular salary and holiday allowances;
- Payment of health and superannuation payments;
- Power to dismiss after giving notice;
- Being required to work in close association with other persons engaged by the employer; and
- Working exclusively for the engaging party.

Other features are typical of an independent contractor:

- Working on one's own;
- Using equipment other than that provided by the engaging party;
- Hiring of employees; and
- Taking a financial risk on a project.

Consultants in the IT industry often have service companies which contract to provide consultant services to the engaging party. Usually, it will be clear that the service company is a contractor, and the consultant an employee of the contractor, although this may not be so for PAYE taxation purposes. However, if service companies are not used, the position may be unclear.

Why Important?

Fuzzy as the distinction between employees and contractors can be, the IT company's interests may depend on it. These are the main implications to consider:

- Copyright in works created by an employee in pursuance of the terms of his or her employment is owned by the employer. However, works created by a contractor will be owned by the contractor unless assigned to the engaging party;
- An employee is under a duty to protect the confidentiality of information to which they have access in the course of their employment. Independent contractors, even those working together with employees on the same project, are not automatically under a duty to maintain confidentiality; and
- Employees during employment are under a duty to act in good faith and to also avoid conflicting interests; the creative results achieved by an employee must be applied for the benefit of the employer. By contrast, a contractor is not automatically under such a duty to the engaging party; a contract is necessary if an equivalent duty is to be imposed.

The Copyright Law Review Committee has recommended in its draft report on Computer Software that the distinction between employees and consultants be done away with, and that the person commissioning software would hold the copright, not the contractor.

Written Agreements

The safest approach is to have written agreements for employees and contractors. Standard agreements are usually sufficient and need not be paper monsters — a comprehensive consultancy agreement may be 10-15 pages; an employment agreement may run out at 5-7 pages.

In addition to clarifying who owns the intellectual property interests, written agreements have other advantages:

- Oral contracts tend to ferment arguments about what in fact was agreed. The longer the term of the engagement, the greater the difficulties for the IT company of providing evidence of its terms;

- Written standard agreements help to ensure uniformity of terms for all employees of one employer, or all the employees in a particular category, or all contractors providing similar services. This minimises the risk of oversights and provides an even-handed basis for your working relationships;
- Written contracts give more protection against allegations by third party software vendors that your employees or sub-contractors were not instructed about the confidentiality of products licensed to you by the third party;
- Limitations on what the employee or contractor can do after termination may be vital to your interests. Unless these limitations are laid down clearly in writing and agreed, they are likely to be contested.

If written agreements for existing employees are introduced then some 'fresh' consideration (e.g. a bonus, a salary increase or promotion) needs to be given in order to create a binding contract.

After Dark

Many employees and consultants in the computer industry undertake work on their own computers, during or outside work hours. This work is related to but does not flow directly from their employment or the consultancy. Uncertainty of this kind impels disputes and litigation. What should be done?

- A well-drafted service agreement or agreement for services should ensure that each party clearly understands what work will be regarded as the property of the IT company, and should ensure that copyright in any related work done by the employee or consultant automatically becomes the property of the employer or engaging party.
- The *Copyright Act* requires an assignment of future copyright must be in writing for an automatic vesting of copyright in the party commissioning the work. A well-drafted contract for services will clarify the parties' respective rights;
- The definition of an employee's job or a consultant's work specification should be as comprehensive and as detailed as possible. This allows the maximum amount of material to be claimed as the product of the employment or engagement. Where an individual is expected to contribute items subject to copyright outside the main job on which he or she is engaged, such items should be mentioned expressly; and
- If an employee has developed something outside normal work hours and has been given a bonus or other benefit because of that work, get an assignment of copyright if the position is not specifically covered under the contract of employment.

Confidentiality

New ways of writing programs or designing equipment are often at risk of being disclosed, as when programmers employed by one company 'swap notes' with fellow programmers employed by other companies. Oral attempts to impose confidentiality restrictions are hazardous because there is no reliable and convincing record of what exactly was said or agreed. Again, it is better to have a written confidentiality agreement.

Confidentiality duties may clash with intellectual property rights, as where a consultant is placed under a duty to maintain confidentiality in relation to a program he or she has developed yet where, as author, he or she has copyright over the program. There can also be conflicting duties of confidentiality. The result may be that neither party is able to exploit the fruits of their efforts. The possibility of such an impasse can be avoided through careful drafting to ensure that confidentiality requirements match the allocation of ownership rights.

Provisions which simply prohibit the disclosure of confidential information are often inadequate. Enforcement is difficult unless it is made clear exactly what range of information is regarded as confidential. A well-drafted confidentiality clause should also indicate the reasons why the employer or engaging party regards the information as confidential.

An agreement not to disclose information does not prevent an employee from making use of information, so restrictions should prohibit both use and disclosure.

Documents supplied to a contractor, or created in the course of the consultancy, may be irrecoverable unless the agreement provides for their return on completion or termination. There should also be a prohibition against copying. In the case of employees, documents or copies made or obtained through the employment belong to the employer but specific provisions dealing with these issues reinforce the law and serve as useful reminders.

Competition Restraints

People working in the software industry are highly mobile and it is impossible to erase their memories before they take up further employment or a new business opportunity. It is possible to protect confidential information after termination by imposing a contractual restriction on the use of the confidential information specified in the contract or by relying on an action for breach of confidence.

However, this protection can be inadequate because the distinction between the confidential information and the personal skill, knowledge or experience gained from employment can be difficult to draw — those who work daily with confidential information tend to re-process it as experience and skill.

The best solution is to have a written restriction on the capacity of the employee or consultant to exploit or undermine any business opportunities which belong to the IT company. To be enforceable, any competition restraint must be reasonable in scope and length and must not be the result of undue influence or coercion. The validity of the restraint depends mainly on these considerations:

- The freedom of the employee or contractor to find alternative work given his or her skills and expertise (eg, a highly specialised software engineer may have less chance of moving into a non-competing area than sales personnel). The courts are unlikely to uphold a clause which will make it very difficult for the ex-employee or former consultant to earn the living to which he or she is accustomed;
- Whether less drastic means could have protected the employer's legitimate interests. Generally, the wider the geographic area covered, the shorter the permissible time limit may be, and vice versa. Restrictions preventing re-employment are harsher and more difficult to justify than restrictions which merely prevent work on a directly competitive product;
- The time when the restraint is imposed. Restraints imposed prior to the commencement of employment help to avoid any suggestion of undue influence (e.g. 'sign this or resign.')

Rather than slapping a standard non-compete period on each employee, the better approach is to judge fairly how much of a 'jump start' the employee would give direct competitors. For example, if the rival company could itself have come up with the idea or process passed on by the employee within three months, then any restraint longer than this is likely to be unjustifiable. Generally, restraints longer than 6 to 9 months will be difficult to uphold in the IT industry.

Preventative Action

The most important resource of many IT companies will be their employees and consultants. As the industry matures, and more software and hardware research and development is carried out in Australia, the prospect of disputes and litigation surrounding the legal relationships with employees and consultants will escalate. Generally, properly drafted agreements can avoid difficulties that may otherwise arise, and ensure that companies comply with all their legal obligations, at relatively little expense.

Brent Fisse is a professor at Sydney University Law School and consultant to Gilbert & Tobin. Peter Waters is a partner specialising in technology and telecommunications. This article is an extract from a recent AIIA publication, the Software Legal Guide, prepared by Gilbert & Tobin.

Bob Mansfield — Maintaining a Customer Focus

Bob Mansfield
CEO, Optus Communications

Bob Mansfield was appointed Chief Executive Officer of Optus Communications in February 1992. On graduating as a Bachelor of Commerce from the University of New South Wales, he joined McDonald's Corporation in 1974 where he progressed from Assistant Accountant to Managing Director. He moved to Reil Corporation in 1987 and prior to joining Optus was Chief Executive of Wormald International. He is a member of the board of McDonald's Australia, Tyco Investments (Australia) Ltd (previously Wormald International) and Optus Communications Pty Ltd. Liz Fell spoke with him last month at Optus' Sydney headquarters.

You must be proud of the preselcction ballot results so far, especially the 18% result in Sydney?
Mansfield: Yes, I'm proud from the organisation's point of view. It demonstrates that a number of people are enjoying the fact that they've got a choice and, secondly, that we've been able to do the job in attracting them in the initial instance. But we've still got a long way to go.

AC: *When you say 'a long way to go,' what will it take?*
Mansfield: Delivering the goods from the point of view of customer focus and delivering better value. I think people are giving us some credit for being the catalyst for a lot of these changes, and there's no doubt we have been. We've got to maintain that. We just can't rest on this initial accomplishment. We're now moving to the next stage of our development in the markets that have been going for 12 months. How do we keep customers that voted for us? And how do we get more of those people that didn't?

AC: *How close are you to achieving your target of 25-30% of national long-distance and international by 1997?*
Mansfield: We've started off better in international long-distance than expected, and not as well in national long-distance. The main reason for that is the vast bulk of national long-distance is in the business market and we've still got all that ahead of us. So there's no mystery as to where the missing links are. We've just got to keep our head down and tail up and keep on proving to customers that competition is working to their benefit.

AC: *Before you arrived, when Optus first released its plans to bid for the licence, it projected 21% of long-distance by mid-97. What happened so you could lift that target?*
Mansfield: I'm probably the one responsible for that. When you look at our initial targets, it really depends on what products you're talking about. It's different for national, international and mobile. I use the overall 25-30% figure to summarise what we're after.

AC: *But that's much higher than the original 21%.*
Mansfield: Yes, but in mobile we should have a higher share than in wireline because there are more new customers. So the 30% factor applies more to mobile than to wireline. If we got 25% of the long-distance market at the end of five years, we'd be very, very pleased. I think we're on track to doing that.

AC: *The term 'market' is rather ambiguous in the ballot context. As Austel pointed out, share of lines is not equivalent to share of traffic.*
Mansfield: Yes, percentage of lines is what the ballot is about. There are people who don't make enough long-distance calls for Optus to be of benefit. I don't know what that figure is, but if you take out 25-30%, and I've seen Telecom quote that, then the 12.2% in Canberra over the smaller base gives a higher figure. So the market share result is higher than the percentage of lines result.

AC: *So assuming heavy users vote for Optus, the market share result would deliver a higher share of traffic?*
Mansfield: Yes. Not all of them do, but a lot of them do because they benefit most from Optus.

AC: *So what is your share of overall long-distance traffic?*
Mansfield: We haven't quoted anything.

AC: *That's why I'm asking!*
Mansfield: I've seen figures quoted in the press of an 18-20% market share. All I can say is that, in Canberra, they're in the ballpark. But Dial 1 has only recently disappeared, so we're only just coming to grips with permanent, long-term traffic patterns. It's higher than 12.2%, there's no doubt about that.

AC: *Would you have preferred to stay with Dial 1?*
Mansfield: If Telecom went to Dial 0, I wouldn't have minded at all! But true competition means you don't have to do anything extra.

AC: *So preselection provides some stability?*
Mansfield: Yes. It gives the initial customer base which is so important.

AC: *Presumably you did some customer research on Dial 1 versus preselection. What did customers prefer?*
Mansfield: Yes, we did. But it's not much good doing the customer research when there's no alternative. The fairest way was to have Telecom Dial 1, us to Dial 2 and the next guy to Dial 3. That wasn't possible, and so be it. A lot of people say what a pain in the butt the ballot was, but look at what Australia has achieved in the last 12 months: More competition to more people than any other country. Whatever negatives there were, there are so many more advantages.

AC: *Did you receive much criticism of the second ballot?*
Mansfield: We got a lot of comments when we first called one in Sydney. But look at it from our point of view. We paid $800 million and negotiated a deal to enter the

market, and inherent in that negotiation was the ability to call a second ballot. Like everything else, you don't please everybody. But if you look at the significant percentage that voted in the second ballot, the customers appreciated it as well.

AC: *I understand you have lodged a complaint with Austel on the speed with which Telstra is providing CLI [Calling Line Identification] in some areas?*
Mansfield: Yes, we've brought it to Telecom's attention several times. We have concerns that they should be doing more areas quicker. But they also have a big balancing act on capital expenditure limitations and trying to cover the whole country within the next five years. So what we're trying to find is the right mixture. Where we have concerns is in areas like Wollongong, Bendigo and Ballarat. It makes it very difficult for us to market when only a few of the people can use us. So we're trying to get what's fair and reasonable.

AC: *Telstra would presumably argue it has met its licence conditions on CLI so far, though it may have changed priorities.*
Mansfield: I recognise they can't do it in the order we would ideally like. Our concern is that we are advertising to a community when only 40% can use us, so the other 60% are abusing us. It's just a frustration, that's all.

AC: *Why didn't you negotiate dates and even penalties for Telstra to implement CLI as part of the access agreement?*
Mansfield: In hindsight, I wish we had. I've asked the same question of my people who were involved in that negotiation. It's interesting that if we don't meet our dates, we face millions of dollars in fines, but they don't have that same pressure.

AC: *Didn't you get a three month extension when you failed to reach the licence condition of 45% of the population with Dial 1 by January 1 1993.*
Mansfield: Yes.

AC: *And you didn't have to pay a big fine?*
Mansfield: No, we didn't, and we were moving with world record speed anyway. But we got publicity about that. No-one's giving us any publicity on doing 70% of the country 12 months ahead of time. The whole system is really working pretty effectively, but there are some frustrations from our side and from their side.

AC: *You've argued that Telstra should invest more at home rather than invest offshore.*
Mansfield: They shouldn't be letting the local scene suffer at the expense of offshore.

AC: *That argument could be seen as helping your shareholder, Cable & Wireless, which is competing with Telstra in the Asia Pacific.*
Mansfield: It's a tough balancing act, and it really comes back to the CLI concern. The prime responsibility, and this applies even more to Telstra which is owned by the public, is to have effective telecommunications services to all Australians.

AC: *Another ballot criticism was the cost.*
Mansfield: I don't know why. Our shareholders paid for it.

AC: *Would you agree that the ad agencies and the media have been major beneficiaries of this competition?*
Mansfield: In the short term. But the advertising issue has really blown out of perspective. I've been with other retailing companies such as McDonald's which spent 4-5% of revenue on advertising. If you take the combined advertising of Optus and Telstra, it would be less than 2% of total industry revenue. It's been a very focused effort in the short-term as we fought for recognition and they fought to defend their territory.

AC: *With increased market share, what happens next? Do you expect a commercial interconnect rate to apply on the CAN [Customer Access Network] and local network rather than the DAIC-based 3.14 cents-a-minute?*
Mansfield: They're the things we're looking at now. There's no doubt that the big issues are interconnect and dominance.

AC: *Yet the dominance issue has been handed over to lawyers and the courts?*
Mansfield: I don't think there is much chance of resolving them without falling back on the legal process because the chances of us agreeing in a commercial sense are, I think, remote. Does that mean we're not going to try? I'm certainly going to, as they will from their side.

AC: *Is it correct that the CAN component of that initial interconnect rate is triggered on preselection, but the local network component must be renegotiated?*
Mansfield: Yes.

AC: *What if Telstra decides that it's no longer dominant in Sydney and unilaterally advertises new tariffs without filing them?*
Mansfield: Which is what they did with mobile. We will do what we did with mobile and claim they are still dominant.

AC: *Have you renegotiated a switched route price on international?*
Mansfield: We're in the midst of that. When you hit certain market share on different routes, a negotiation starts.

AC: *That's not technically an interconnect rate is it?*
Mansfield: No. The big issues are the 3.14 cents per-minute-per-end and the mobile rate which is up for renewal in January. There are different elements of interconnect to be negotiated at different times, but the whole issue of dominance is the big question.

AC: *On the international routes, have you publicly revealed what percent of traffic you've won to different destinations?*
Mansfield: No, we haven't. But the successful destinations are no mystery.

AC: *What about your your traffic to China?*
Mansfield: China has been very significant. In fact, the ethnic market as a whole has been very supportive of Optus.

AC: *Is that because of Telstra's failure to market there?*
Mansfield: I think there's an element of that. But until we came along, 40 countries had off-peak rates. Today every country you can direct dial has off-peak rates, so we've got 220 different countries. Those things have been caused by Optus. In fact, our guys say they don't know of any other telecommunications company that provides an off-peak rate to every calling country in the world.

AC: *You've built a $500-600 million a year business in 18 months . . .*
Mansfield: Less than that.

AC: *How important was the Government's so-called tilted playing field?*
Mansfield: I don't see how anyone can say it's tilted when 18 months ago we didn't have one customer. We bought into an environment where we could make significant inroads over a short period of time because interconnect and so on were decided up front. That's been known for four years.

AC: *You don't see that as tilted?*
Mansfield: No. Telstra had the same notice as we did. Because we have a speedier means of accessing the market, and I've agreed with Frank Blount on this, Telecom has to move quicker than any other deregulated monopoly in the world. The reason we paid $800 million rather than $300 million was because the Government had an asset which included both the satellite and the environment. By painting the environment that way, we paid more dollars.

AC: *But you actually paid the amount that was Aussat's debt. Was that coincidental?*
Mansfield: Yes, it was totally coincidental, though I wasn't involved in those discussions. But Frank and I agree on the fact that we're able to penetrate the market much quicker than anywhere else.

AC: *Do you and Frank Blount talk often?*
Mansfield: Yes.

AC: *Do you have lunch with one another?*

Mansfield: No, though we had lunch the other day with the Lord Mayor. It was funny. We were at a Business Council meeting in Melbourne and we were just having a talk in the corner when everyone stopped and turned around in amazement.

AC: *A photographer would have loved that moment!*
Mansfield: That's what Bob Gottliebsen said! Frank's got a tough task, as I have. But at the end of the day we both run pretty sensible businesses.

AC: *When Telstra is allowed to compete freely, do you expect price discounting to eat into your revenues?*
Mansfield: When we've got substance such that those actions won't be anti-competitive, I've got no problem competing on that basis. But right now if we didn't have the provisions that we do have, we would not even get going because Telstra wouldn't let us.

AC: *Were the ballot results the basis for your statement that you expect revenues to double in the next 12 months?*
Mansfield: And the fact that we're getting to the rest of the country and we've got more products coming out.

AC: *Is that forecast predicated on Telstra competing freely or subject to restrictions?*
Mansfield: The big grey area is where dominance cuts in and cuts out. In our view, it certainly doesn't cut in when you've got 80-85% of the market.

AC: *Assuming Telstra was not dominant, would you still expect revenues to double? Would price discounting have an effect?*
Mansfield: I don't think they're too interested in doing things for nothing. There's been significant price decreases already. The price has dropped over 20% in the last 12 months. I've got no problem in doing that as and when we've got the substance to counter the fact they have the customer access network and they're the only ones that have all the traffic information. When you ask me about market share, quite honestly I can't answer that.

AC: *On the initial interconnect charges, you've argued they're too high for Optus to provide local calls. Is that correct?*
Mansfield: My point was that 3.14 cents per-minute-per-end is 6.28 cents per-minute-per-phone call. If you multiply that by four, you're up over the cost of a local call.

AC: *But I think Telstra argues that 75% of local calls are less then four minutes.*
Mansfield: Well, I haven't heard that argument. I can't comment on it.

AC: *How much should a local untimed call be to make it worthwhile for you?*
Mansfield: We haven't done that calculation. But we are looking at what an untimed interconnect factor should be to provide competition in local calls. We have a vision of being involved in local calls, and we will be. The question is: how do you do it? Our view is that it will be done by wireless technology. But if we felt it was worthwhile to negotiate an untimed interconnect rate, we'd look at it.

AC: *Are you happy with Austel's performance or are you in favour of a broad competition body?*
Mansfield: It's a tough role, there is no doubt about that. In the early days, I think there's no option other than to have a specialist body because it's such a technical business. Once the playing field has settled down — and the arguments about whether it's tilted or not have waned . . .

"To just rent lines from Telecom and have no control over how quickly a problem is fixed other than relying on them, is not the way to [provide business services]. So how do you do it? You put in your own fibre optic loops, you put in the electronics. It takes time. We're doing it faster than any other country, and the business community is saying we're slow!"

AC: *But it opens up to more competition in 1997.*
Mansfield: Yes, it opens up again. That's why our recommendation to the Hilmer report was that it should be a specialist area. If you put it among everything else, it would be hard to get the degree of comprehension required to handle the myriad of questions that arise.

AC: *Are you still taking the Flexi-Plan issue to court now the Minister has announced he will change the legislation?*
Mansfield: Yes, because we don't know what the legislation is going to say. The Flexi-Plan marketing technique that Telecom has chosen, I respect that decision, and I've got no desire to wreck every Flexi-Plan. There are millions of customers affected by it. But we have a major concern about the issue of bundling.

AC: *Are you planning to bundle long-distance and mobile?*
Mansfield: There is a difference between bundling in a dominant and non-dominant position. We don't bundle right now.

AC: *Are you planning to?*
Mansfield: We'd be happy to take an option of legislation where you don't bundle at all. But if bundling is going to be operative in the marketplace, and we think it will, the issue is when can bundling be accommodated such that it's not anti-competitive.

AC: *Would you bundle Mobilesat with terrestrial services?*
Mansfield: We don't bundle right now.

AC: *But you haven't started Mobilesat yet.*
Mansfield: As and when it comes, we'll look at that. But Mobilesat bundling, when we're dominant in satellite, has implications too. I haven't thought that through.

AC: *Why haven't you launched Mobilesat, given Optus B1 has been available for nearly 12 months?*
Mansfield: The only problem is developing the handset.

AC: *Didn't NEC start work on those nearly three years ago?*
Mansfield: Yes, but it's a brand new product that's never been done anywhere else. We expect to have it up and running between the end of the first quarter and the end of the first half of next year.

AC: *So is the handset awaiting growth of offshore mobilesat markets such as the US?*
Mansfield: No. Definitely not. We've got commitments from NEC and also Westinghouse to develop the handset and that is well underway. It's just taking longer to get the final handset the way we'd like it because it's new.

AC: *How much will it cost?*
Mansfield: I think it was in the $5,000-7,000 range when we first looked at it a few months ago. Our aim is to make sure it works and drop the size and price. The interest in Mobilesat has been quite extraordinary.

AC: *Are you happy with the decision to scale back Telstra's analogue mobile network?*
Mansfield: To us, it was fundamental in our discussions with the Government, and I constantly bring it up. We're spending billions of dollars on that being delivered. The reason we're building the GSM network aggressively is because we've got a chance to have that as the operative network. What we're saying is that's the environment we bought into, so we want nothing more than that being delivered.

AC: *Was the closure of the analogue network guaranteed in your sales deed?*
Mansfield: It certainly was in Vodafone's. It was an issue discussed with us. I'm not sure it was documented.

AC: *What is your strategy for shifting mobile customers from analogue to digital?*

Mansfield: We've got to be creative and be ahead of the next guy in what we're offering and how we're going about it.

AC: *The price doesn't encourage people to move across. Will digital ever be cheaper?*
Mansfield: I think the price of digital compared with the analogue of today will be comparable in the next couple of years. The progress on handsets in Europe is quite staggering in terms of size, battery power and so on. We expect the next generation to be available next year.

AC: *In the GSM market, I assume you'd agree that Telstra is not dominant?*
Mansfield: Absolutely.

AC: *Yet I understand that the initial DAIC-based interconnect rates apply to your GSM service?*
Mansfield: You're getting pretty technical here.

AC: *We've talked about the interconnect rates already.*
Mansfield: What do you mean by DAIC-based rate?

AC: *The initial, non-commercial rate that applies to your interconnection with Telstra's network.*
Mansfield: In our view, it's not 'non-commercial,' but they believe it is. That's all being negotiated.

AC: *Does the initial DAIC-based rate apply to GSM?*
Mansfield: Let me talk it through. If I call from this digital phone to your house, part of the way I rent Telecom's network.

AC: *But if Telstra's not dominant in GSM, why are you getting that same initial interconnection rate?*
Mansfield: They're dominant in the customer access network.

AC: *So Telstra is viewed as dominant because of the CAN?*
Mansfield: That's why we believe dominance is a long-term prospect. That's exactly why. Let me tell you where they're dominant. They own this network . . .

AC: *Sorry, 'this' being . . . ?*
Mansfield: Analogue. For us to connect a customer, we have to interact with the Telecom control of the overall network because it's their network. In the [digital] network, if someone wants to get into our system, we can do that 100% according to what we can deliver. To an extent, we always have to go through Telecom for this. Their ability to connect a customer of Telecom in five minutes when our connection takes 20 minutes is inherent in the fact that they control this system.

AC: *With GSM customers?*
Mansfield: Yes. If we take 20 minutes to connect our GSM people and they take five minutes to connect their GSM people when they're totally independent, that's where the rubber really hits the road. At the moment we can't do this. So dominance is a huge issue. The problem is that the term is used in the legislation with no definition.

AC: *Turning to business services, I've heard criticism that you have focused on long-distance and mobile and forgotten the large corporates who after all were the major group pressing for competition?*
Mansfield: And who 'after all' are getting significantly lower prices because we're around! They forget that. My answer is that from Day One we've never forgotten them. The only way to enter that market in a truly differentiated sense is to have a technical quality that we can control and to guarantee a level of service from personnel. To just rent lines from Telecom and have no control over how quickly a problem is fixed other than relying on them, is not the way to do it. So how do you do it? You put in your own fibre optic loops, you put in the electronics. It takes time. We're doing it faster than any other country, and the business community is saying we're slow!

AC: *Well, you have launched international services. Your smart Interlink brochure lists service units in about six countries. Do they belong to Optus or Cable & Wireless?*
Mansfield: There's a mixture. We can take care of worldwide account management if the need arises.

AC: *Does C&W operate on your behalf?*
Mansfield: Yes. We interact with them and make sure that customers with worldwide requirements can be serviced.

AC: *So in the case of one-stop shopping, that could be provided by C&W?*
Mansfield: Absolutely. C&W played a significant role in the negotiation with the Department of Foreign Affairs and Trade to make them comfortable that if there were problems at the other end, we could interact with people to get them serviced. There's a big opportunity for us to work with C&W and BellSouth.

AC: *How are you actually sharing that lucrative Foreign Affairs contract with Telstra? The initial press reports implied you had won the whole contract.*
Mansfield: We never suggested we won it all. We won a significant part. It's a $7-8 million contract over three years or something like that.

AC: *Have you managed to win facilities management contracts with any international corporate customers?*
Mansfield: Yes. For instance, Saturn Global Networks are a customer of our Facilities Management Centre.

AC: *Do you think a few supercarriers, possibly including C&W, will eventually dominate the global market?*
Mansfield: It's fascinating at the moment. Just telecommunications is fascinating, but if you throw in the media, computing and entertainment, we're seeing a massive race among all the participants for the right answer, and nobody knows where it's going to end up. Telecommunications is going to be important, but there will be other elements as well.

AC: *How is the satellite Pay TV delay affecting you?*
Mansfield: It's frustrating.

AC: *Are you using that capacity for other services?*
Mansfield: We are on a temporary basis. But we can't use it on a permanent basis because of our commitment to the Government. The biggest frustration is the fact that when we bought Aussat there was going to be a gap of considerable time between somebody operating satellite-delivered Pay TV and other things. But if you look at what's happened since with the talks on cable and MDS, then that gap has shrunk. We're extremely concerned about that.

AC: *But you still have a guarantee to get Pay TV customers. Do you need them?*
Mansfield: Well, we're a telecommunications company and Pay TV is important for us, but relatively small. We want to be involved in it for sure because it's the start of the whole access to the home and all the rest of it.

AC: *Do you need Optus B3 when it is eventually launched?*
Mansfield: Yes, we do. We could use much more capacity for two reasons. One is in our own telecommunications network. It's the 'belt and braces' approach where we are able to backup the whole network. Secondly, satellite is important in the way this whole convergence exercise is going.

AC: *Will ISDN be offered early next year as originally planned?*
Mansfield: We're reviewing all those programs now based on our capabilities today, bearing in mind that we've got to take care of our mobile and long distance products as well. But the ISDN launch is expected at the end of the first quarter in 1994.

AC: *In your presentations to industry last year, centrex was to be introduced in mid-1993. What happened there?*
Mansfield: We looked very seriously at trying to introduce centrex in mid-1993, but

our growth in mobile and long distance has been so significant that we just had too much to do justice to that product. It's been in our program to start in mid-1994, but we're hoping to introduce it earlier.

AC: *I understand that you won a bid from the Queensland Government to provide centrex services for them and then pulled out?*
Mansfield: If I can't deliver, then I prefer to face that reality up front.

AC: *In terms of delivery, that would require a level of expertise which could be available from BellSouth?*
Mansfield: That wasn't the problem. Bearing in mind we're building a company as well as adding product lines, to accelerate that product by 12 months would have had an enormous impact just on the OSS development.

AC: *Did you need to begin Phase II of OSS [Operational Support Systems] development to deliver it?*
Mansfield: You need OSS to bill and so on. There's no technical difficulty and there's no lack of resources. It's just that it was all so quick.

AC: *So you bid for that contract before you were ready?*
Mansfield: We accelerated our program in order to bid for that contract. Then I recognised, together with Ian Boatman, that we might have got the contract and stuffed it up.

AC: *When is OSS Phase II going to start?*
Mansfield: OSS is not a product. It's a philosophy. It is developing an operational support system based on customer needs today and tomorrow rather than just accepting what they wanted yesterday. Most telecommunications companies have got too much invested sunk cost to throw one out and put in a new one. We're starting from scratch.

AC: *Is it essentially a new software system?*
Mansfield: It's software that adds flexibility so we can provide customers with what they want. Phase I was to get it off-the-shelf and up and running. Right now we're in the process of finalising our specific action plans for Phase II, which will involve a lot of Australian development because we have a commitment to Government. We really won't break the back of that for two or three years. But it will be an ongoing philosophy.

AC: *Have you had problems with the off-the-shelf software?*
Mansfield: Has it been effective? Yes. Look at what we've done. Have we had problems with it? Yes. What's caused the problems? The rapid ramp-up in growth and customer numbers.

AC: *I was thinking of the 'lost calls' in Canberra where Austel found your information system didn't record those calls . . .*
Mansfield: There's not one element of proof in that. We dispute that totally.

AC: *So you dispute Austel's findings?*
Mansfield: The answer at the end of the day is that the umpire has given a decision so let's get on with the game. Have you ever read all the facts on that? I'll show you. We had one goal and that was to fix the problem and we knew we couldn't control fixing the problem. I've got a couple of graphs here.

AC: *But the umpire decided your system hadn't recorded those calls and you're saying that . . .*
Mansfield: There's no evidence for that at all. Let me tell you the truth. Of 100% of the data we submitted, they based that conclusion on .03% of the data.

> *"What has amazed me is that this is a business that most people use every day. Even petrol, you use every day, but you don't fill your car up every day. It's an astonishing responsibility to recognise that."*

AC: *So Austel's conclusion is based on partial data?*
Mansfield: We agreed that there weren't any lost calls with the periods they randomly picked. What we're saying is keep looking through the data. They've got restrictions on resources, of course. But the conclusion on the lost calls was this: there was a problem, and within 48 hours it was fixed. We did nothing. That's full stop.

AC: *Has the off-the-shelf software limited the range of services you can offer?*
Mansfield: No, it was not so much the software as our aggressive timetable.

AC: *Has it limited your billing?*
Mansfield: Has it limited billing to the point of not being able to bill? No. Has it limited our billing so that we can't put mobile and long-distance together in one bill? Yes.

AC: *I assume that limits your ability to customise. For instance, you offer overall discounts on long-distance.*
Mansfield: Yes, the flexibility and all that. That's where Phase II has enormous opportunities. If we'd gone for the dream, we wouldn't be there.

AC: *Is your job different from what you expected?*
Mansfield: From the customer side — not very different. What customers want really doesn't vary with the product. What has been a surprise is the regulatory side of the business, never having been subjected to it in the past. What has been a surprise is the fantastic reaction of customers to choice, how exciting the industry is, and how big the growth prospects are. What excites me about this industry, more than anything else I've ever been part of, is that mobile alone is growing 40%, prices are dropping and service is improving.

AC: *Are you saying hamburgers didn't grow at the same rate?*
Mansfield: In percentage terms, they probably did.

AC: *So you're getting into fast industries — fast food and fast phones.*
Mansfield: Yes! The opportunities are massive.

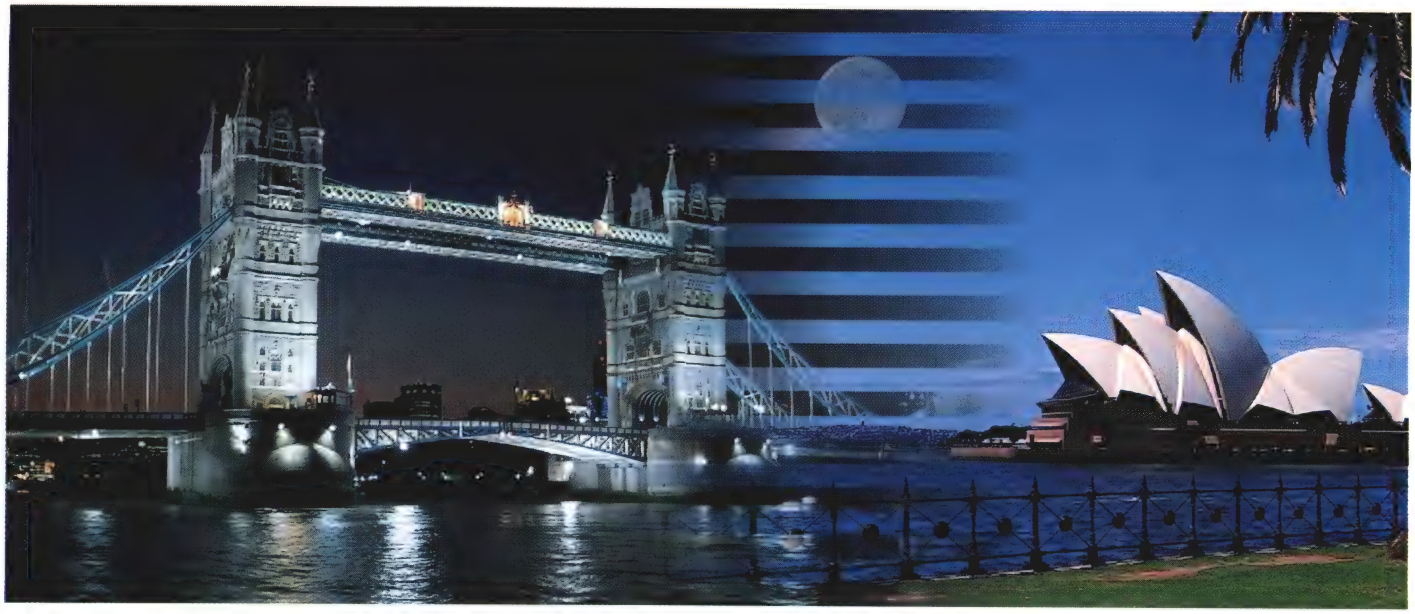
AC: *Do you sometimes feel snowed by the engineers?*
Mansfield: I don't try to compete with them. You only feel snowed if you pretend that you can! I drive that very hard. If you look at mobile phones, you can have twice as many functions technically, but you probably need half as many and you need a charge that is three quarters as much.

AC: *Do you always identify with the customer?*
Mansfield: Absolutely. It's no good building a network that's a monument to excellence if it's too expensive for the customer to use. What has amazed me is that this is a business that most people use every day. Even petrol, you use every day, but you don't fill your car up every day. It's an astonishing responsibility to recognise that.

AC: *Have you had any disappointments?*
Mansfield: It was unfortunate, but I think unavoidable, that in the early days there were a number of issues that became so bitter between Telecom and ourselves. I'd like to think they could have been avoided, though they haven't been avoided anywhere else. In a competitive world when you're having your own backyard trodden on for the first time, it's hard. I really sincerely believe they're behind us.

AC: *If you weren't arguing, you'd probably be accused of collusion!*
Mansfield: Exactly. If I had a wish, what would it be? I'd like OSS Phase II to be 90% complete because the customer focus opportunities as a point of differentiation in this business are staggering. The customers are just ending the first 18 months of being cared about, they love it, and they've got this forever. So they're in for a good time.

Liz Fell is a freelance journalist based in Paddington (NSW).



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EICON TECHNOLOGY

AusComms Buys a Wide Area Network III

Faced with the same set of specifications, how would our leading WAN vendors respond? In the first part of a two part article, Graeme Le Roux presents the results of our third wide area networking survey.

This is the third year that *Australian Communications* has had its fictional corporate alter-ego, AusComms Pty Ltd, buy a full-scale wide area network system. As in previous years, we've come up with a set of requirements for AusComms and then requested a cross section of the networking industry to supply their preferred solution.

This year the AusComms Request For Information (RFI) was designed to highlight the ability of the industry to assist average customers in managing a migration as well as providing a cost effective solution to a customer's business requirements. The average customer in Australia is not a bank with a huge SNA network, it's a mid-size company with a less-than-current model minicomputer or mainframe. It has a few offices scattered around the country, some large, most small, and it is probably in a bread-and-butter business built on a database system. Such systems are not usually complex in terms of software design — in many cases they are not even particularly efficient — but they work and keep on working with a small support team and periodic maintenance.

Porting these systems to new hardware platforms is generally to be avoided at all costs, however when they no longer serve business needs this potential nightmare must be faced. When that happens change is typically not gradual, since such businesses can't often afford the expensive lead times which are normal in large companies, particularly in the current economic climate.

Two Main Requirements

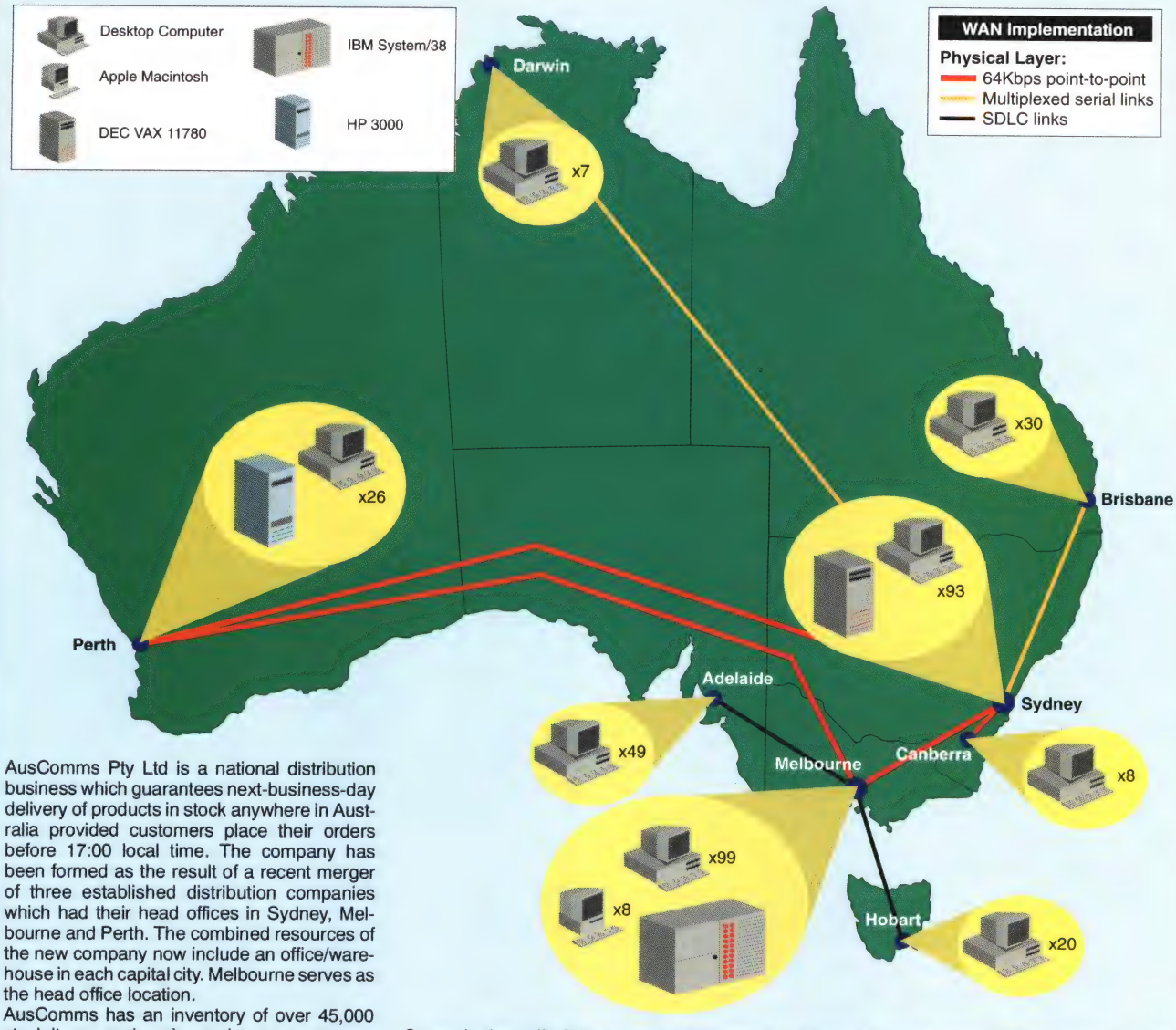
We decided to write this RFI (see page 62 for a summary) as it might be written by the EDP manager of AusComms. This manager, due to corporate circumstances beyond his control, has recently inherited responsibility for two distinct systems based in Sydney and Perth, about which he knows little or nothing and neither of which resemble the company's Melbourne-based IBM System/38, which until recently was his only responsibility.

To buy time to source and deploy a new system that meets his employer's changed business needs, he and his staff have managed to implement a limited (and unspecified) level of interaction between these three disparate systems. When respondents questioned just what this system was, they were told that it was held together by the computing equivalent of gaffer tape and chewing gum, its only redeeming feature being that it worked.

Our fictional EDP manager is now seeking information. He is trying to find out what his options are; he does not have the information required to make a decision on which standards and technologies are most appropriate to his needs. Therefore he is in no position to write a tender. But he does have the experience of his staff and their knowledge of his firm's systems, so he can put together what he thinks is a reasonable set of guidelines, he can make an educated guess at the type of system he will need and the processing load it will have to handle, and he can state his business needs.

Some much for fiction. We wanted to get as broad a range of responses as we could, and to publish as many as space would permit.

The AusComms RFI — A Summary



AusComms Pty Ltd is a national distribution business which guarantees next-business-day delivery of products in stock anywhere in Australia provided customers place their orders before 17:00 local time. The company has been formed as the result of a recent merger of three established distribution companies which had their head offices in Sydney, Melbourne and Perth. The combined resources of the new company now include an office/warehouse in each capital city. Melbourne serves as the head office location.

AusComms has an inventory of over 45,000 stock items, and each warehouse can source products from suppliers within its State or Territory — and in the case of Sydney, Melbourne and Perth, from overseas. In general, each warehouse sources products manufactured outside its State from the State in which the manufacturer of that product is based. For example, a product manufactured in Perth will be sourced by the Perth warehouse. If the Sydney warehouse requires stock of that product it is ordered from the Perth warehouse.

AusComms' inherited EDP system includes minicomputer hosts in Melbourne, Sydney and Perth linked to PC-based systems at other locations. In Melbourne, the system includes IBM 5251 and 5294 cluster controllers linking terminals, printers and PCs to an IBM System/38. In Perth, a Hewlett-Packard HP 3000 running HP's version of Unix links PCs via HP StarLAN. In Sydney, the system includes a Digital VAX 11780 and local warehouse bar code readers and printers connected via terminal servers.

This legacy system does not suit AusComms' needs and it will be replaced within the next 12 months. It has been decided that any replacement system will feature a distributed architecture and be based on an SQL platform.

Currently, the traffic flow across the company's telecommunications links (aggregate of both host-to-warehouse and host-to-host) in any 24 hour period exhibits a normal distribution which is negatively skewed toward a peak of approximately 121Kbps at roughly 15:00 local time — i.e. the peak in Perth occurs about two hours after the peak in Melbourne. The mean value of this curve is roughly 84Kbps. Monitoring of host accesses indicates that this traffic is mostly (approximately 98%) due to placement of orders with warehouses and queries on stock availability between hosts, therefore it is anticipated that the gross nature of this traffic flow will not change with deployment of the new system. It would seem probable that the peak and mean traffic values will alter slightly, resulting in a 'flattening' of this curve.

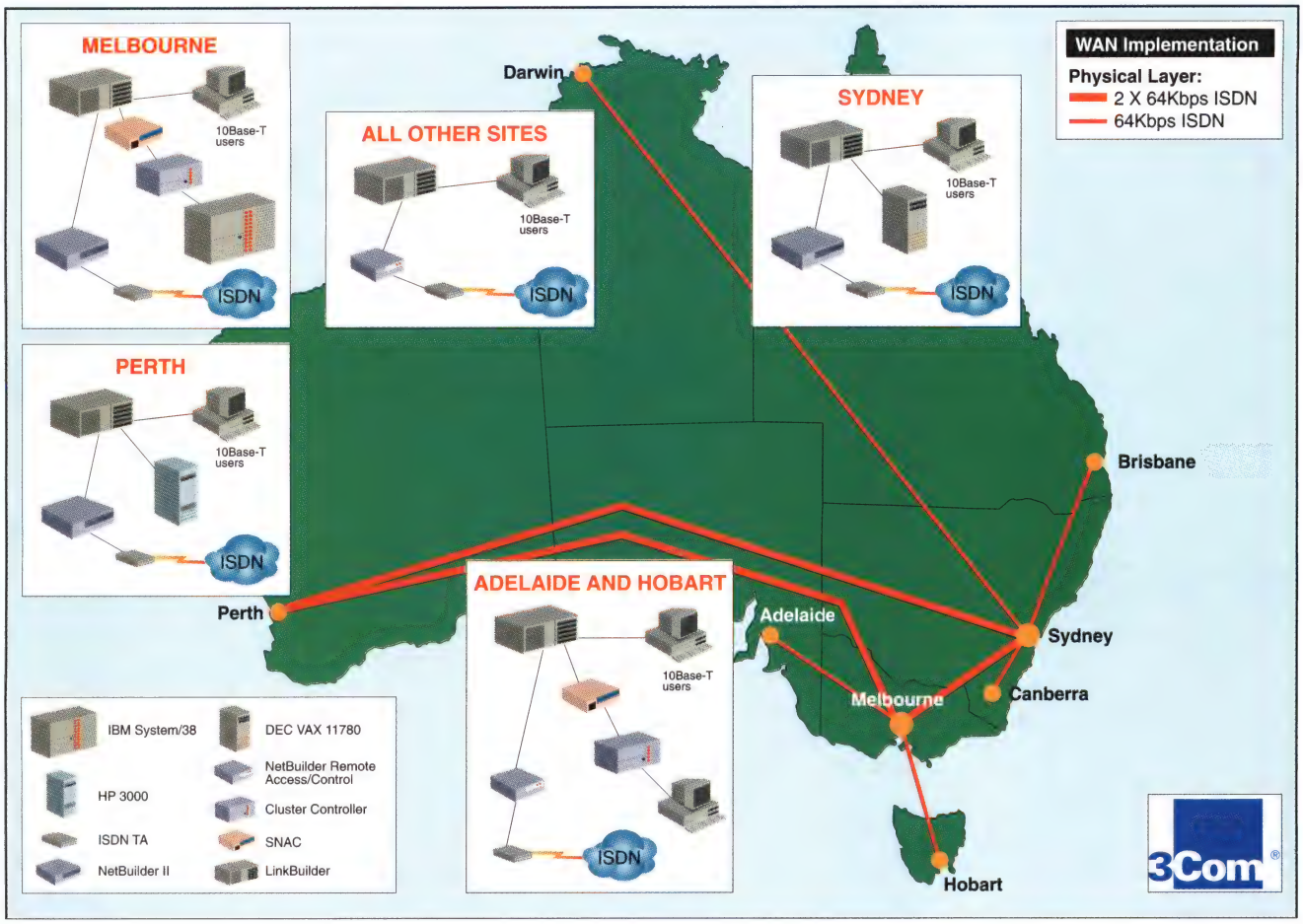
Major changes are expected in the wide area traffic flow between the hours of 18:00 and 08:00 local time once the new system is deployed. Currently there is little or no traffic during these hours. With the deployment of a distributed SQL-based system and an enterprise e-mail system AusComms has estimated that wide area traffic during these hours will vary between 32Kbps and 48Kbps.

Once the new system is implemented overseas products will be sourced only by the Melbourne warehouse. The Darwin and Canberra warehouse operations will be shut down and those offices will place orders with the Brisbane and Sydney warehouses respectively. As a result, a moderate but significant amount of voice and facsimile traffic is anticipated between these sites. An increase in inter-office voice and facsimile traffic is also anticipated due to marketing and higher level management functions being based at head office.

AusComms requests details in two main areas:

- WAN links including, but not restricted to, remote routers and bridges, modems, carrier services and system management; and
- LANs at each site including, but not restricted to, local routers, local bridges, user access and system management.

The hosts for this new system will be required to communicate via a standard routable protocol. AusComms has inherited a class B internet address from one of the companies from which it was formed. Since AusComms seeks to establish overseas offices it is likely that TCP/IP will be the protocol of choice, although AusComms seeks comments in this regard.



We are also acutely aware that responding to an RFI like this requires a substantial effort on the part of the organisations to whom it was submitted. With this in mind, we split the response we sought into two main parts; a pure LAN/WAN transmission system for which all respondents were required to submit a proposal; and a request for suggested platforms/systems, both hardware and software, and any other options such as data/voice integration, training, support, etc. which respondents could provide.

This approach allowed companies like 3Com (which does not provide any product or service other than LAN/WAN transmission systems equipment) to showcase their products and skills on an equal basis with companies like Digital which can provide a package which includes every product and service AusComms' EDP staff could ever need.

This year sees responses from Toren Computer Communications, Digital Equipment Corporation, JNA, 3Com ANZA, MPA International, GEC Alsthom, Datacraft and Ungermann-Bass. IBM Australia and Apple Computer were also approached and a copy of the RFI was submitted to each. IBM did agree to participate but after bouncing the RFI around several layers of lumbering bureaucracy for several weeks, the combined resources of what is still the biggest computer company in the world failed to generate a response. Apple at least was able to bow out early in the piece in a professional way.

We regret the absence of both companies, since it would have been interesting to compare IBM's response — which might have included AS/400s or RS 6000s — with Digital's. We would also like to have seen an Apple-based solution (Apple certainly has more than a little experience of this sort of application in many overseas countries).

Regular readers will also note the absence of a response from Com Tech. The company was invited to respond but considered it inappropriate to do so. This is unfortunate since it eliminates the possibility of contrast between NetWare 4.0, UnixWare, NT and Banyan's VINES. The lack of any response using Cisco's routers, for which Com Tech was recently named a distributor, also prevents a comparison of its technology with Wellfleet, Retix, 3Com, Digital, Datacraft and Ungermann-Bass.

ISDN, NT and VINES Preferred

In this month's edition responses from MPA International, Toren Computer Communications, 3Com, GEC Alsthom and Digital are presented.

Features of this month's responses are the dominance of Telecom's ISDN as the preferred wide area carrier technology, the use of Microsoft's NT on both Intel and non-Intel platforms and the complete dominance of Ethernet. In spite of the RFI clearly stating that no technology or standard was preferred and AusComms' RFI guidelines being clearly prefaced by the statement that 'respondents should not feel restricted by these guidelines' nobody suggested the use of Token Ring in spite of the obvious argument that a synchronous access scheme might simplify database synchronisation on servers in a distributed database environment, and therefore increase overall system reliability. Synchronous access schemes were not entirely left out, however, since Digital's response did include some FDDI equipment.

Another feature of all responses is simplicity. All respondents have been very careful to propose the deployment of devices and software which is either plug-and-play or which can be managed remotely in all of the AusComms offices which lack local support. WAN topographies are also very simple. Realistically, someone at all sites which are equipped with databases will have to attend to such mundane matters as changing backup tapes, etc. Remote backup of a database of this size is likely to be quite impractical over any WAN link that AusComms could afford — even allowing for data compression.

The size of AusComms' operation was carefully chosen to make the widest pos-

sible choice of processing platforms practical. What all respondents who deal directly with their customers have emphasised, both in their written responses and in conversation, is that they would expect to work closely with AusComms' staff during all stages of the new system's specification — i.e. pre-tender — and its deployment. A number of responses offered facilities management services in addition to regular maintenance and support. Facilities management — outsourcing — is big business overseas and the market is beginning to boom here.

Next month, in addition to responses from JNA, Datacraft and Ungermann-Bass, Moresdawn Pty Ltd, which actually prepared the RFI, will present its response and we will also look at just how close to 100% Australian such a system can get.

3Com ANZA

3Com ANZA, which is 3Com's Asia-Pacific headquarters sells its products exclusively via its VARs, GEC Alsthom Information Technology being one of them. This means that 3Com cannot readily provide a complete response to AusComms' requirements — it is restricted to its own product range. As a result, 3Com has responded within the strict scope of the RFI, i.e. to AusComms' requirement for a LAN/WAN transmission system. 3Com's response is brief, but the system it proposes is by no means inadequate, nor does it restrict AusComms in any way, as 3Com's NETBuilders will route all common routable protocols.

This response is built on the use and expansion of AusComms' existing wide area links. The diagram shows simply '2 x 64Kbps' and '1 x 64Kbps' links. 3Com's NETBuilder bridge/routers can be configured to handle any kind of carrier services which are available in Australia, so the response simply refers to basic links rather than specifying a particular technology.

3Com suggests the deployment of NETBuilder IIs in Sydney, Perth and Melbourne linked in a triangle as the WAN backbone. This topography provides redundant paths, and allows the NETBuilders to load balance and make optimum use of their in-built compression technology. To minimise administrative overhead 3Com proposes the use of its boundary routing system architecture and thus the deployment of either NETBuilder Remote Control or Remote Access units in Darwin, Brisbane, Canberra, Hobart and Adelaide.

Boundary routing (which 3Com recently trademarked as Boundary Routing System Architecture) is an idea which network designers have been using in various forms for years. Indeed, in the mid-80s 3Com's long dead 3+NetConnect was actually an XNS boundary router which was implemented in software. The approach addresses three main problems which arise when one has to connect a number of LANs in an internet: the administrative overhead of an internet with a large number of routers, the need to conserve sub-net address space and the cost of deploying expensive hardware in a large number of often small sites. In essence, it is simply the deployment of a basic bridge at a remote site which is set to filter on a bit mask which corresponds to the local network address.

AusComms' hosts would be connected to this wide area via their local LANs; the VAX 11780 directly via its 10Base-5 interface, the HP 3000 via a standard Ethernet interface (the StarLAN interface may require upgrading) and the System/38 via a Sync Research SNAC box. 3Com has a agreement with Sync Research to develop SDLC-to-LLC2 conversion products.

The Sync Research SNAC box, which is distributed in Australia by Network Systems Technology, converts an SDLC session from the S/38 into an LLC2 session which can be tunnelled across the WAN. In Hobart and Adelaide another SNAC reverses the process, providing an SDLC session to the S/38's existing cluster controllers. The SNACs terminate SDLC sessions locally, which neatly avoids control timing problems which may be caused by network latency. NETBuilders are also capable of prioritisation of data on the basis of set type of service parameters which further insures that the new system will be transparent to the S/38.

3Com proposes this arrangement purely to simplify wide area telecommunications links —it is not attempting to actually integrate the S/38 into the network. Workstations which require access to the S/38 would simply have network adaptors installed in addition to existing 5250 emulation cards. Naturally 3Com recommends its own Etherlink adaptors. 3Com supplies most of the world's PC Ethernet adaptors and the Etherlink family includes NuBus adaptors for the Apple Macintoshes in Melbourne.

3Com recommends the use of its LinkBuilder hubs as required in all AusComms' office LANs. The LinkBuilder range of Ethernet hubs consists of the LinkBuilder unmanaged hub/repeaters (TP/12, AUI/AUI, AUI/Fibre — SMA or ST — and AUI/BNC); the LinkBuilder FMS stackable, manageable hubs (10Base-T/2/5, Fibre — SMA or ST); the LinkBuilder ECS chassis-based unit (all Ethernet standards, redundant power supply, thermal management, SNMP management module, 802.1 management module and terminal server module); and the new LinkBuilder MSH. The LinkBuilder MSH handles all Ethernet and Token Ring standards and will be 3Com's premier ATM platform. The LinkBuilder range also includes FDDI and Token Ring-only hubs. 3Com proposes the use of its terminal servers to connect serial devices in warehouses to the network.

Comments:

3Com's response to the AusComms' RFI is simple, standards-based and built around solid, field-tested technology. Its solution to carrying the S/38's traffic is particularly elegant. With the use of data compression the system probably has more bandwidth than required, but then over-engineering is infinitely better than under-engineering.

3Com ANZA can be reached on:
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Fax: (02) 498 6771

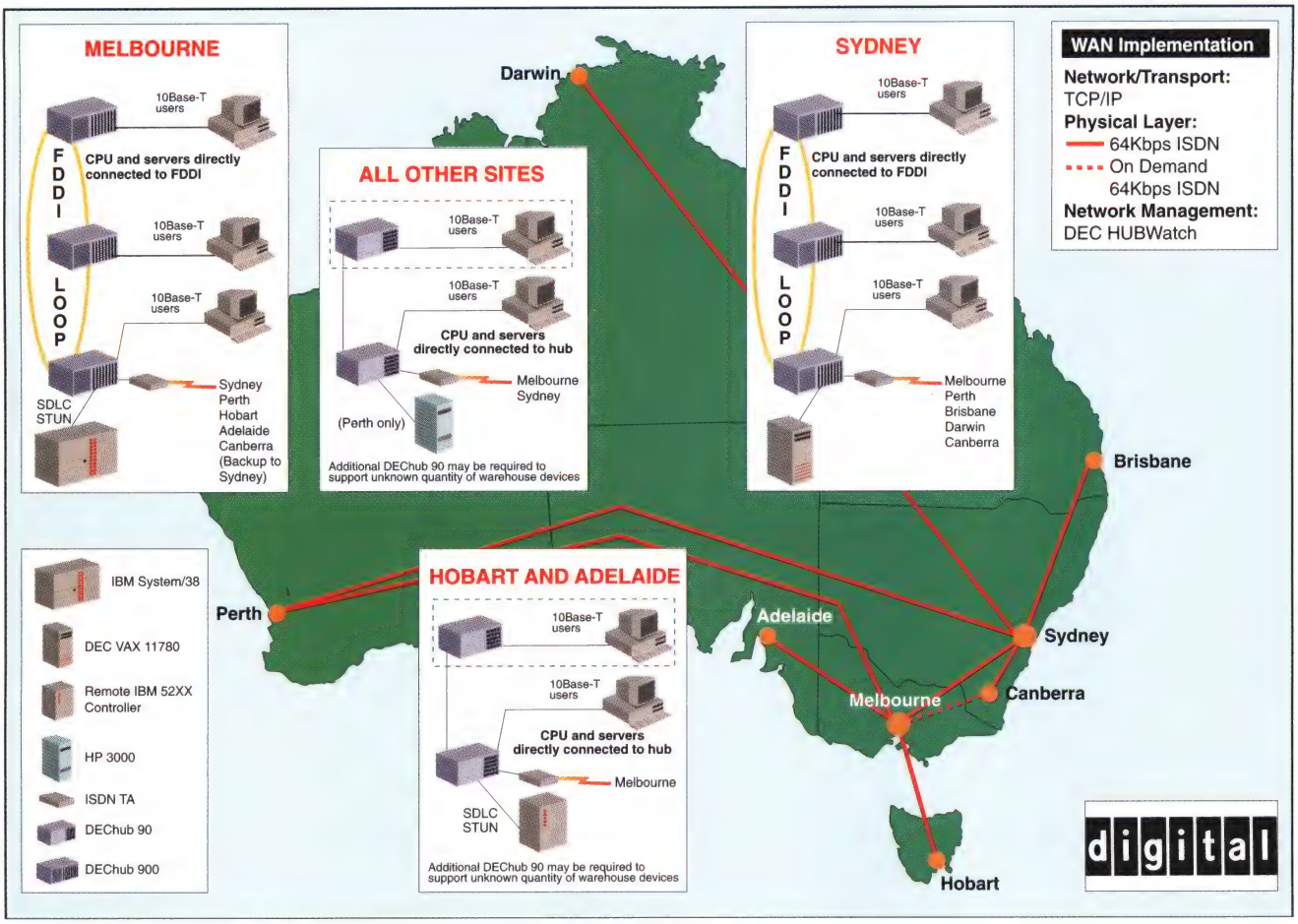
Digital Equipment Corporation

Digital Equipment Corporation has been operating in Australia for around 30 years and over that time has acquired a very broad customer base with a wide variety of business requirements. As a result, the company has come to see its primary business as providing services which meet its customers' needs rather than simply selling its products. Digital's response is built around a combination of its own hardware and services, Jtec's ISDN terminal adaptors (TAs) and internationally recognised standards.

As is shown in the accompanying diagram, Digital's response is based on ISDN. Specifically, Digital's new DECBrouter 90s housed in DEChub 900s or DEChub 90s at AusComms' Sydney, Perth and Melbourne offices linked in a triangle of semi-permanent connections. Sydney and Melbourne also act as the hub of a star of ISDN links to the offices which their existing hosts currently serve — i.e. Sydney to Darwin, Brisbane and Canberra; Melbourne to Adelaide and Hobart. A dial-on-demand ISDN link from Canberra has also been specified. This link provides an alternate path to the Sydney-Perth-Melbourne backbone triangle in case of excessive load on the east coast. This region represents the bulk of the company's offices and therefore, on the basis of the data given in the RFI, the bulk of the company's network traffic.

All ISDN links are made via Jtec TA's using basic rate connections. If voice services are to be integrated into the network then primary rate services would be used. Digital uses Jtec's products (including Jtec's JUMP management software) and ISDN for its corporate WAN, into which voice traffic has been integrated, and has specified such systems for customers.

At each of AusComms' offices Digital proposes the use of the OPEN DECConnect Structured Wiring System with Category 5 UTP for all horizontal runs and fibre optic cable for vertical runs and/or campus backbones. The OPEN DECConnect Structured Wiring System complies with the EIA/TIA 568 Commercial Building Wiring Standard and is installed in Australia to comply with AS 3080 (the Australian Standard for Integrated Communications Cabling Systems for Commercial Premises). The system can



be scaled to meet the needs of the smallest workgroup LAN through to the largest enterprise network. Digital proposes the installation of FDDI rings in Sydney and Melbourne to which all servers and an appropriate number of DEChub 900s will be directly connected. Digital considers such a passive solution to be significantly superior to a collapsed backbone topography using multiple routers. All other AusComms sites will have an appropriate number of DEChub 90s installed.

Where required, DEChub 90s at any single site will be linked in a daisy-chain configuration or via DECBridge 90s. DEChubs can be configured with a variety of devices ranging from 10Base-T/2 concentrators (10Base-T Ethernet is specified as the standard for all workstation connection throughout AusComms), 10Base-FL/A repeaters, local bridges which support all Ethernet standards, FDDI bridges, terminal servers and management units.

Not surprisingly, the preferred network management platform in Digital's proposed system is its own HUBWatch, which is SNMP-based, runs under Windows on a PC platform (as suggested for AusComms' initial solution) or on Digital's other platforms under Ultrix or OpenVMS and will be used in conjunction with DECAgent 90s at remote locations. TCP/IP is the preferred protocol for the entire system.

Digital intends to replace AusComms' existing point-to-point wide area links between the System/38 in Melbourne and its cluster controllers in Hobart and Adelaide with ISDN links by using the STUN protocol developed originally by Cisco. STUN simply allows an SDLC session to be tunnelled across a TCP/IP-based WAN. Digital points out that this solution depends on an acceptable latency across WAN links. There is, in Digital's view, no point in the installation of a gateway and the integration of the existing S/38 into the new system, since it is to be decommissioned as soon as possible.

Where necessary new or existing PC workstations can be fitted with suitable emulation cards and be connected to the new LAN and the existing system's cluster controllers. The software on the VAX 11780 in Sydney would be upgraded to support TCP/IP, which would be cheaper than installing bridges for existing LAT protocols. In Perth, the HP 3000 would simply be connected to the local LAN. Digital has assumed that the current home-grown host-to-host communication system can be accommodated by the new WAN links.

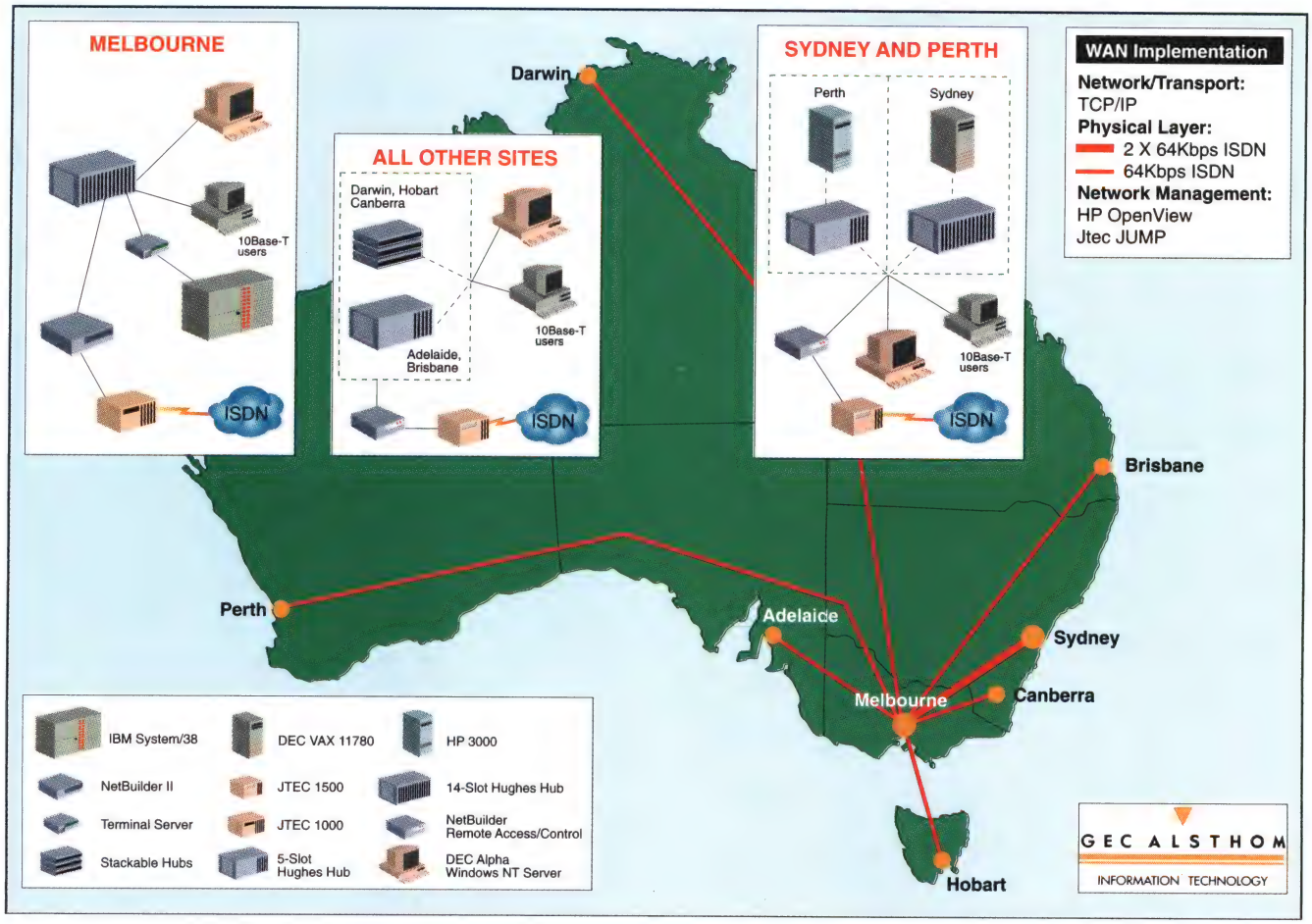
Digital proposes the use of its own Intel-based PCs as AusComms' standard workstation. These new units and existing PCs would be fitted with an appropriate Digital network adaptor and Pathworks software. Digital has also suggested its Alpha AXP hardware as a host platform running either Digital's OSF/1 or Microsoft's Windows NT. Digital has refrained from recommending a final software platform (although OSF/1 is its first choice), stating simply that it 'would seek to work closely with AusComms to determine in detail the business requirements and most appropriate mix of products.'

Digital's response also makes note of its facilities management, support, maintenance, training and installation services.

Comments:

Digital's response to AusComms' RFI reflects its perception of its primary business — that of servicing its customers' requirements. The breadth of products and services which it proposes to supply to AusComms is no more or less than is required; Digital's proposed system is one of the simplest we received. This simplicity is undoubtedly the result of the company's extensive experience in field support, and disguises a degree of subtlety.

The network topography as specified is a case in point. Soon after Digital received the RFI, company officials sent us a list of questions regarding the model we had used to come up with the traffic flow description in the RFI. On the basis of our answers — which were the same as given to all other respondents who asked similar questions — Digital stated that AusComms' prediction of



the bandwidth requirements for its new system was pessimistic.

This was perfectly true; remember that the fictional EDP manager writing this RFI had neither the knowledge nor the experience to model traffic flow properly. Digital suggested that AusComms' retain its services — either as part of a Digital response to tender or as an independent service — to analyse the current network traffic load. This is a service which many companies might not expect to be available unless they were buying a Digital system.

Having made this point, Digital set about specifying a WAN topography based on its calculated line utilisation of 63% (the RFI was based on a 75% figure). The topography specified in its response should result in a reasonably constant latency under normal operational conditions which will be an advantage for both the existing System/38's terminal traffic — which will be carried via STUN protocols — and the new SQL database applications which will probably function best in an environment with reasonably constant latency.

A similar degree of thought has gone in to Digital's recommendation of FDDI at AusComms' Sydney and Melbourne sites. On the surface it may seem that Digital has simply seen the lack of restriction in the RFI as a chance to plug its favourite backbone technology, and to some extent this is undoubtedly the case; however there are good arguments in favour of FDDI at these sites.

Firstly, physical layout of these sites, which are AusComms' largest, is unknown, therefore a campus is a possibility — other sites are too small for this to be likely. Secondly, the basis of the company's operations will be a series of database applications and there is a high probability that traffic will, by the nature of AusComms' structure and Australia's demographics, be concentrated at these two sites. Being a synchronous access scheme, FDDI will provide a deterministic latency even under extreme loads, and therefore permit the SQL applications to perform with maximum efficiency.

Digital's response also makes it abundantly clear it is no more than a broad set of suggestions which the company feels are most likely to meet AusComms' needs and that they would not be prepared to make a more definite response without discussing AusComms' business needs in detail, doing a careful analysis of its current system's performance and carefully modelling a suitable system based on the result of such discussion and analysis. In short, Digital has been doing this sort of thing long enough to know better than to stick its corporate neck out.

Digital Equipment Corporation can be reached in Sydney on:
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GEC Alsthom IT

GEC Alsthom Information Technology (GECAIT) was formed in January 1993 and is composed of six divisions which provide a complete range of direct sales, distribution, pre- and post-sales support, training, systems integration and facilities management services on a national basis. One of GECAIT's divisions is Network Solutions Australia which provided this, the most detailed response to AusComms' RFI.

GECAIT has proposed a system built entirely on ISDN. As the accompanying diagram shows, a star topology is suggested with a single Jtec J1000 Macrospan unit managing primary rate access in Melbourne and Jtec J1500 Microspan units managing basic rate access in all other offices. These Jtec units can be configured as TA's for data only or a mix of voice and data. Jtec units support a variety of PABX interfaces including G.703 and both 2- and 4-wire analogue. GECAIT suggests that all Jtec units be configured with X.21 interfaces which will be used by 3Com NETBuilder bridge/routers. GECAIT claims that it has the support capability to swap these units in two hours, half AusComms' requirement of four hours, at any of AusComms' sites, and therefore it proposes to deploy only single NETBuilders at each site. It believes, given the reliability of the 3Com NETBuilder,

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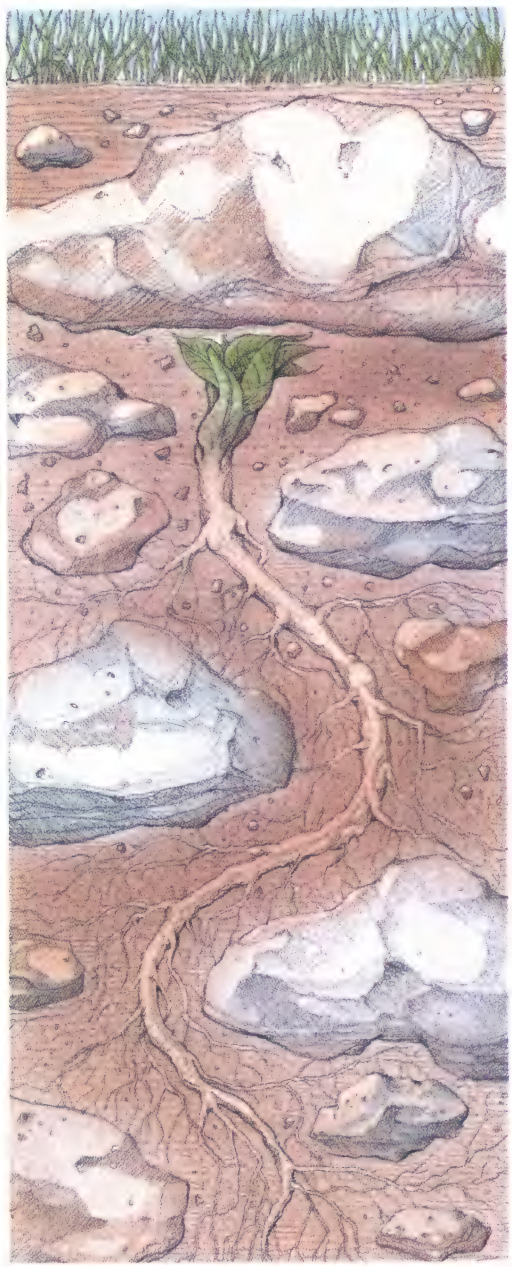

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that this is a more cost effective option than redundant routers.

GECAIT chose Melbourne as the hub of AusComms' network not only because it is the company's head office but because, at the time of writing, ISDN primary rate access in Melbourne is claimed to be highly reliable. Jtec's JUMP software, which runs under Microsoft's Windows 3.1, will be used to manage all Jtec equipment. GECAIT sought an indicative quote from Telecom for the installation of carrier services and current annual rental costs, which were given as aaround $5,800 and $162,000 respectively.

The hub of the network will be the Melbourne office at which GECAIT intend to deploy a 3Com NETBuilder II configured with one port per remote office (total 7) and an Ethernet interface to the Melbourne LAN. 3Com NETBuilder Remote Access bridge/routers would be deployed at AusComms' Brisbane, Sydney, Adelaide and Perth offices. These devices are scaled down versions of the NETBuilder II and have one WAN port and one LAN interface. They are intended for deployment at small remote sites where there is little or no administration infrastructure but where a fully fledged bridge/router is required.

GECAIT proposes to make full use of 3Com's boundary routing system architecture to ensure that the level of WAN administration required at any site is consistent with the capabilities of that site. The company proposes the use of 3Com NETBuilder Remote Control units at each of AusComms' Darwin, Canberra and Hobart sites. The NETBuilder Remote Control is a router capable of only the most basic forwarding decisions, which has only one WAN port and one LAN port. The unit is designed to be installed by someone with little more technical qualifications than the ability to match plugs to sockets.

For the LANs at each of AusComms' offices GECAIT proposed a complete Category 5 transmission system based on Krone K100 Category 5 patch panels, MM Data Cables' Category 5 UTP cable (4 pair, 100 ohm) for horizontal runs and MM Data Cables' 62.5/125 micro multimode fibre optic cable for vertical runs. All sites are to be saturation cabled — i.e. at least two cables run from distribution frames to each workstation. This system meets or exceeds AS 3080. GECAIT's reasons for installing a full Category 5 cable system is that it will provide the most reliable system for AusComms' current needs and offers the most options for the support of AusComms' future needs.

This system will support all current and proposed Ethernet network standards, TP-PMD/CDDI and ATM. To ensure this, GECAIT will perform attenuation, NEXT and noise certification tests at 100MHz on all cable runs to ensure compliance with EIA/TIA TSB-36 and TSB-40 Category 5 requirements.

GECAIT intends to use Hughes LAN Systems Third Generation Enterprise Hubs throughout AusComms' LANs. In small sites — Darwin, Canberra and Hobart — 24 port stackable models would be deployed while larger 5 slot chassis based units would be deployed in all other sites except Sydney and Melbourne. Since Sydney and Melbourne are the company's largest sites 14 slot chassis models would be deployed.

The chassis-based models in Hughes range of hubs feature multiple passive backplanes, hot swappable modules, load sharing power supplies, environmental monitoring and distributed management. All Hughes hubs feature in-built SNMP management capability.

Hewlett-Packard's OpenView Network Manager for DOS is GECAIT's choice for an initial network management platform with the option of migrating to a Unix-based version as AusComms' needs dictate. The choice of OpenView is based on its ability to manage all routers and hubs, integrate emerging management standards and scale to AusComms' requirements.

As is indicated by GECAIT's choice of SNMP as an enterprise management protocol, its network solution is based on the TCP/IP protocol suite. For workstations, the company intends to deploy Digital's DECpc PCs running Microsoft's Windows for Workgroups, TCP/IP and Microsoft Office, which includes an e-mail client. GECAIT indicated that it would prefer to make a final decision as to which TCP/IP was most suitable after a full site inspection.

After such an inspection it would recommend either Microsoft's TCP/IP for Windows for Workgroups, FTP's PC/TCP or NetManage's Chameleon TCP/IP. Suitable Ethernet adaptors and Mac TCP software would be added to all Apple Macintoshes and equivalent Microsoft software installed. Microsoft Mail is the preferred e-mail platform.

AusComms' core business systems requirements will be met by Control, an application built on Cincom's Mantis 4GL and their Supra RDBMS. GECAIT has chosen to use Microsoft's Windows NT on Digital's Alpha AXP 150 system as their standard server platform for AusComms. All user file storage, printing, Control applications and electronic mail systems will be provided on this platform. GECAIT cites Windows NT's scalability, performance, robustness, responsiveness, high capacity and object-oriented technology as the main reasons for this choice.

The question of support for serial devices such as bar code readers has been left open in GECAIT's response. These devices may be connected via PCs or terminal servers (which presumably would be supported by code on the NT servers). GECAIT did not consider that sufficient detail had been supplied in the RFI to make a firm recommendation in this matter.

As part of GECAIT's proposed migration plan it suggests the installation of TCP/IP on the existing Digital host in Sydney and the installation of a twinax-to-asynchronous ASCII converter. These devices, which permit users to access the S/38 via Telnet, are rare, however GECAIT informs us that it has experience with three suitable units. No unit was specified since 'the issues of emulation would need to be addressed.'

GECAIT's response is completed with a suggested list of training courses for AusComms' operations staff, details of relevant services which it can provide, an indicative budget and a draft Project Plan which conforms to AusComms' given proposed deployment time frame.

Comments:

GECAIT's response was complete, concise and contained all necessary detail. It is obviously the work of a company which expects to hold a profitable maintenance contract on the proposed system. In fact the main criticism to which GECAIT is liable is that of overkill; calling its proposed LAN cable plant bullet-proof is an understatement, and Digital's Alpha provides almost ridiculous amounts of processing power in a box which looks like a desktop PC. One Alpha AXP 150 could easily take over the processing load of a medium size minicomputer of the vintage of AusComms' hosts. As a result, AusComms' network would have CPU power to burn. But overkill or not, GECAIT's response suggests a simple, consistent and easily administered system which should behave predictably in operation.

Another point which is worth mentioning is that the use of TCP/IP to workstation level, which will result in some increase in administrative overhead, will have the effect of slowing down Digital's workstations, since all suggested TCP/IP stacks have real mode drivers while Windows for Workgroups version 3.11 runs in protected mode. To work with a real mode driver means expensive (in terms of speed) transitions. Whether or not this issue would be significant would depend on the model of DECpc chosen as the standard workstation.

Finally GECAIT's response to the question of integrating the terminal-type devices in AusComms' warehouses is interesting. GECAIT chose NT over VMS, Ultrix or OSF/1 all of which support terminal servers. The company pointed out that many warehouses connect these devices to PCs and stated that without knowing exactly how AusComms' warehouse operation worked it was better to keep all options open.

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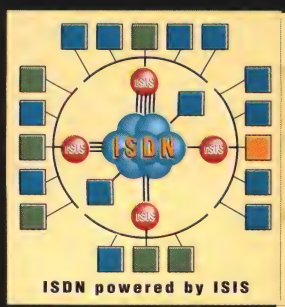

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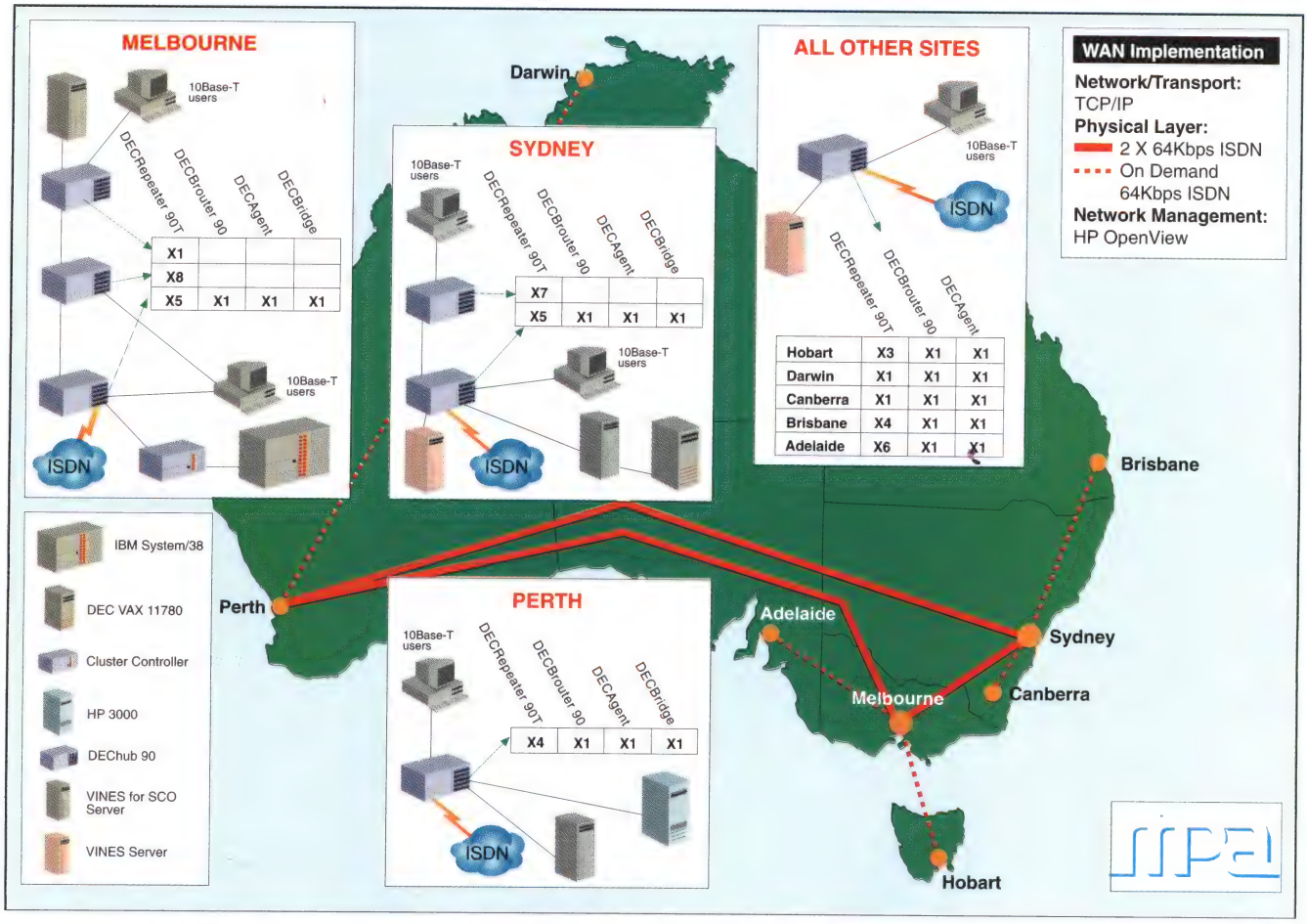


MPA International

MPA International is the exclusive Australian distributor for Banyan's VINES, with which it proposes to provide a major part of AusComms' basic requirements. MPA also has a distribution agreement with Digital Equipment Corporation, allowing it to base its solution to all AusComms' LAN/WAN transmission system requirements on Digital's DEChub family of products.

As the accompanying diagram shows, MPA has chosen ISDN as the most appropriate technology to provide wide area carrier services. It proposes a triangle of semi-permanent links between Perth, Sydney and Melbourne and dial on demand ISDN links to all other sites. The bandwidth on all proposed links is 64Kbps. This could be scaled as needed. MPA suggests that ISDN could be justified for all sites on the basis of voice/fax/data integration. No ISDN TA is specified in MPA's response. Access to all WAN links at all sites is via Digital DECBrouter 90s, which would be installed in DEChub 90s. MPA's protocol of choice is TCP/IP. DEChubs and their modules would be managed by SNMP and HP OpenView; this will require the installation of DECAgent 90s in DEChubs.

For AusComms' LANs MPA has chosen 10Base-T as a horizontal standard and, where sites are large enough to require multiple distributed DEChubs and therefore local backbones, MPA has suggested the use of DECBridge 90s. The DECBridge 90 fully supports 10Base-2, 5 and 10Base-FA, L/FOIRL Ethernet standards.

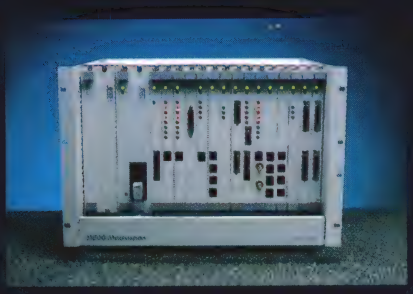
AusComms' processing needs are provided for by the deployment of two types of server platform: an AcerFrame 3000 running SCO MPX and VINES for SCO, providing a platform for core business systems and Compaq ProSignias running Banyan VINES for e-mail, word processing and other bread and butter applications. MPA suggests ORACLE 7 using SQL as the basis for AusComms' core business applications. All servers will be managed via VINES' proprietary Network and System Management Option with a single VINES SNMP proxy agent installed to permit these functions to be accessed via OpenView. MPA does not specify any preferred workstation platform. The use of Racal Interlan 3210 Ethernet adaptors is suggested for file servers while Racal Interlan's EtherBlaster (NI6510) is MPA's choice for workstations.

The VINES product line includes a version of FTP's PC/TCP which can be installed on a VINES server and integrates with VINES services. This approach simplifies administration and allows total system access to be controlled via VINES' StreetTalk distributed directory service. The use of VINES Option for Macintosh, with an unspecified Ethernet adaptor, integrates the small group of Macintoshes in Melbourne into this system (presumably with Mac TCP). VINES also has an Intelligent Messaging service which has the potential to provide an e-mail backbone for the system.

MPA's use of a VINES-integrated version of FTP's PC/TCP allows direct communications with the Perth-based HP 3000, provided it is equipped with a standard Ethernet interface. For access to the Sydney VAX 11780, MPA has suggested three options: either upgrade the VAX to support TCP/IP; install a terminal server to make serial ports on the VAX available over the network; or install a Banyan VINES Intelligent Communications Adaptor (ICA) and VINES Asynchronous Terminal Emulation in a Sydney server. This last option is functionally equivalent to installing a terminal server, but much cheaper. Which option MPA would finally recommend would depend on the functions required by AusComms and the number of users accessing the VAX.

MPA considers that there is no justification for any attempt to integrate the System/38 based in AusComms' Melbourne office into the new network system. It suggests that AusComms' existing PCs, which are equipped with 5250 emulation cards, have Ethernet adaptors installed so that they

Solutions



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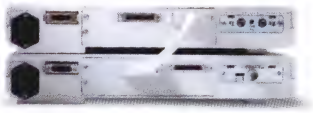

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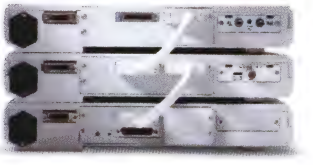

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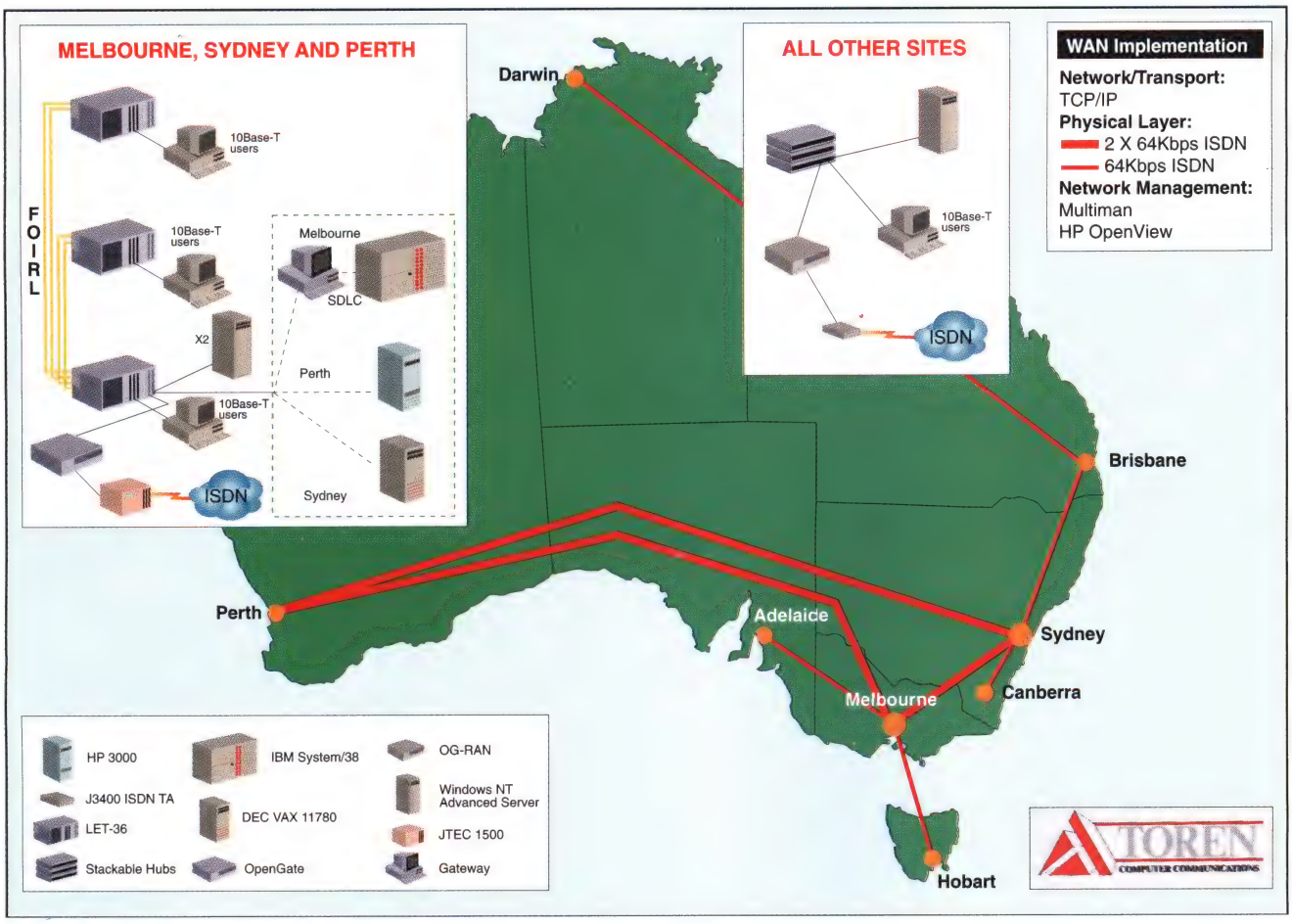

can access the VINES servers and the S/38 concurrently for the duration of the migration period. The 5250 terminals would be replaced with similar PCs equipped with both emulation cards and network adaptors as necessary. Existing 5250 printers would remain as is. This approach necessitates the retention of existing point-to-point links to the Hobart and Adelaide offices and the links between the S/38, VAX and HP hosts for the duration of the migration period.

For general network printing MPA's solution offers the choice of either printers which directly attach to local Ethernets and would be controlled from VINES servers or the use of the VINES PC Network Printing Option. This option permits a VINES workstation, which need not be dedicated, to provide a network interface for a locally attached printer. Print queues for such workstations reside on the server controlling the printer. This solution has minimal impact on the workstation.

Other serial devices such as bar code readers, etc. in AusComms' warehouses may be attached to the network system either via terminal servers controlled via SCO and TCP/IP, direct serial connections to the AcerFrames or via PC workstations as appropriate to AusComms' needs.

Comments:

MPA's response presents a simple, but robust system. By using a combination of Digital's 90 series hardware, Racal network adaptors, Banyan's proprietary operating system and services, and SCO Unix it has provided a very flexible and scalable system platform. It has also taken particular care to contain the costs of integrating AusComms' existing hosts which the RFI indicated would be decommissioned within six months of the initial deployment of the new systems.

One of the most attractive features of the response is the consistency of the system management solution. But one minor point not noted is that up to four DEChubs may be daisy chained. Where this is physically possible and network traffic loads permit, DECBridge 90s need not be installed.

During the process of putting together this response MPA fell seriously foul of Murphy's Law and, as a result, its staff were forced to prepare and submit a final response in just under 10 hours; they are to be congratulated for their efforts.

MPA has offices around Australia and can be contacted in Sydney:

Tel: (02) 906 4499

Fax: (02) 906 4727

Toren Computer Communications

Part of the Ipex Information Technology Group, Toren Computer Communications is capable of providing a complete range of services in the areas of design, implementation, service and support, including facilities management. Toren can also arrange training via Ipex Training Services. The company is the major Australian distributor of RAD Network Devices (RND), Lannet, Fibronics and D-Link products, along with the Ipex range of workstations and servers based on Intel processors. Toren has a strategic partner relationship with Novell, and is a Microsoft Integration Centre. As shown in the accompanying diagram, Toren has based its response on TCP/IP, ISDN, RND routers and compression bridges, and RND's version of boundary routing known as Central Access Routing (CAR).

The core of Toren's proposed WAN is a triangle of basic rate ISDN links between Sydney, Melbourne and Perth in which both B channels will be used for data. These links are controlled by RND OpenGate Model C-12 multiprotocol bridge/routers. Toren suggests the use of the redundant power supply and fan options available for these devices. Each of these devices will act as the hub of a star of ISDN connections, using only a single B channel, to RND Router Access Nodes (OG-RANs).

An OG-RAN is a CAR feeder node which makes filtering/forwarding decisions based solely on network addresses. Since none of the complex routing algorithms must be implemented at this level, the OG-RAN has a plug-and-play con-

figuration, is relatively fast, and is very cost effective. OG-RANs will be placed in AusComms' Darwin, Canberra, Adelaide and Hobart offices. Since the Brisbane office must act as a feeder for Darwin, Toren has recommended the use of an entry level, and therefore less costly, version of the OpenGate; the OpenGate Multiprotocol Access Router (OG-MAR).

All RAD Network Devices' products are managed via an SNMP-based software package called Multiman, which would run under HP OpenView. The intent is to use OpenView as the enterprise network management platform. It is recommended that a Unix system be installed in Melbourne to provide a platform for this software and that support personnel based in Sydney and Perth access this unit via XTerminal software, presumably running under Windows. Alternatively Windows versions of Multiman could be deployed in Sydney and Perth. Toren has chosen OpenView with an eye towards the future integration of management functions for the Windows NT environment, which is proposed as the standard server platform.

The RND equipment will be connected to the ISDN carrier network via Jtec J1500 modular units in Melbourne, Sydney and Perth, while other sites will use Jtec J3400s. These Jtec units provide the capability to multiplex voice/fax and data traffic with little in the way of added cost.

Toren has chosen to suggest Microsoft's Windows NT Advanced Server, running Microsoft's SQL server for NT, and Sybase, running on the existing Digital and HP hosts, as the platform of choice for AusComms' future SQL-based system. Why not Novell NetWare? The company cites NT's scalability, ease of management, open architecture (i.e. the ability to run TCP/IP as a native protocol), remote access (which Toren propose as a last resort back-up link), pre-emptive multitasking, Hermes (Microsoft's software control and distribution service), a single network logon process for users, in-built Macintosh connectivity and the fact that having to combine IPX and TCP/IP would unnecessarily complicate the network.

NT Advanced Server's interoperability with the Sybase SQL product which would allow the retention of the existing Digital and HP hosts is also a feature of Toren's solution. Ipex Centra 2000 Super Servers, which may be configured with either 80486 or Pentium processors, are recommended as the platform of choice for NT-AS. Toren has also recommended the use of a UPS for all NT servers. Windows NT has a built-in UPS service. The Centra 2000 features an EISA motherboard, redundant fans, power supplies, remote management, security pad access and RAID 5 support. The idea is to install these systems scaled as required on a site-by-site basis.

On the workstation side of things Toren suggests Ipex 486-DX-33 PCs equipped with D-Link VESA LAN adaptor cards. VESA is recommended over EISA simply because it costs less and gives roughly equal performance. Toren recommends that Chameleon TCP/IP, which is implemented completely as Windows DLLs and thus is very efficient, be loaded on all workstations to avoid using Microsoft's non-routable NetBEUI protocol. Toren proposes the total replacement of AusComms' installed base of terminals with Ipex PCs.

In AusComms' warehouses Toren suggest the use of battery powered, handheld devices which transfer data via a PC serial port. This approach is suggested on the basis of Toren's in-house experience at its PC production facilities in Melbourne, and neatly eliminates the complication of terminal servers and serial terminals.

At larger sites, such as Sydney, Perth and Melbourne, workstations are to be connected to the LAN via 10Base-T links to Lannet LET-36 hubs over Category 5 UTP. Where appropriate, multiple Lannet hubs would be interconnected via FOIRL links and Lannet's Matrix Switch Module, which is similar in function to the Kalpana Etherswitch and Chipcom's Ethernet Interconnect Module. A similar, 10Base-T Matrix Switch Module is to be used to connect hosts, servers and printers equipped with direct network interfaces to the network on dedicated 10Mbps channels. Lannet refers to this technology as LAN Per Port (LPP). At small sites such as Canberra and Darwin Lannet LANstack stackable hubs with SNMP agents would be substituted for the LET-36 units.

Toren initially suggested the use of Windows NT Advanced Server's SNA Services to provide a gateway to the System/38. When it was pointed out that this is unworkable due to the S/38, unlike an AS/400, being unable to directly control a 3270 device, Toren suggested that a gateway capable of emulating a 5250 cluster controller be deployed on a separate platform — presumably a workstation configuration which could be used as such after the S/38 was decommissioned. Toren's policy in these cases is to use gateways to avoid potential conflicts with workstation network adaptors.

Comments:

The strict scope of AusComms' RFI was a LAN/WAN transmission system, and in this regard it is difficult to find fault with Toren's response. Toren's proposal for AusComms' smaller sites where there are no support staff is particularly attractive, since it requires almost no site-specific configuration other than for Jtec's TAs. While not as well known in Australia as some US and European-based companies, RAD Network Devices and Lannet Data Communications (which is a member of the RAD group which is based in Israel) are well known overseas. Combining these devices with Jtec's ISDN products provides a powerful and extremely flexible WAN/LAN solution.

Both Jtec and RAD have management products which run under Microsoft's Windows 3.1. Given this fact and Toren's preference for NT, it would seem that there is little point in introducing the complication of a Unix management host and XTerminal software. Even though NT may be manageable via OpenView in future, there is no indication in the response that Jtec's devices will be.

Given Toren's preference for a Unix management host, perhaps a Unix/Sybase platform would have been appropriate for AusComms' stock control system, while NT-based SQL servers could handle AusComms' other needs — electronic mail, report generation, order entry, standard applications (e.g. Microsoft Office), etc. This would also have made use of existing serial terminals, bar-code readers, printers, etc. in warehouses via the use of terminal servers which can be installed in the Lannet hubs. The consistent use of a single host platform would also allow the decommissioning of all AusComms' existing hosts, which was the company's original intent.

Toren has chosen to use TCP/IP as the transport of choice for all network nodes. While TCP/IP is probably the only viable choice for long term server-to-server communications and workstation-to-host communications across the WAN, during the migration period the permanent deployment of NetManage's excellent Chameleon TCP/IP would result in a significant administrative overhead. If Windows NT is to be deployed as Microsoft has designed it to be — i.e. as a platform for client-server computing and distributed applications — then this overhead might be avoided by upgrading all workstations to Windows for Workgroups, which is ODBC and MAPI capable, using non-routable NetBEUI protocols and using local NT servers to front end the warehousing system.

Windows for Workgroups version 3.11 also operates completely in protected mode and, provided hardware support is available, performs full 32-bit disk and file access. On the basis of the specifications of the Ipex workstations it would seem that this 32-bit access would be supported. If this were the case Windows for Workgroups version 3.11 would provide perceptibly superior network performance, since Chameleon TCP/IP uses real mode drivers.

Toren's response also includes details of its extensive capabilities in the areas of maintenance, training and support.

Toren has offices around Australia and can be contacted in Sydney on:

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Graeme Le Roux is a Director of Moresdawn Pty Ltd (Bundanoon, NSW) and specialises in local area network consulting services.

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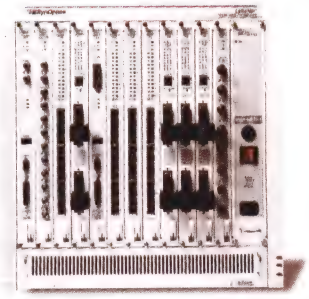

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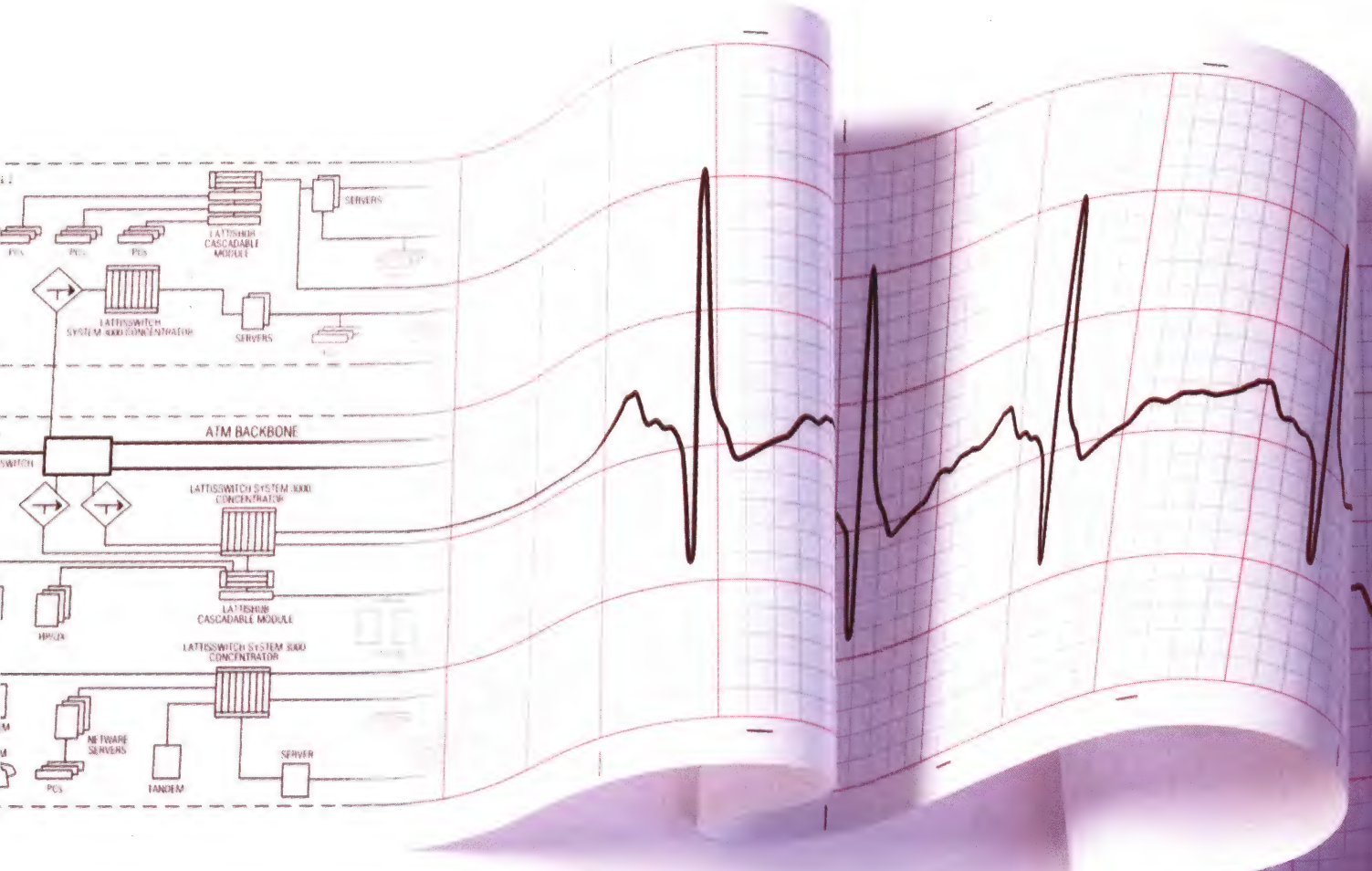

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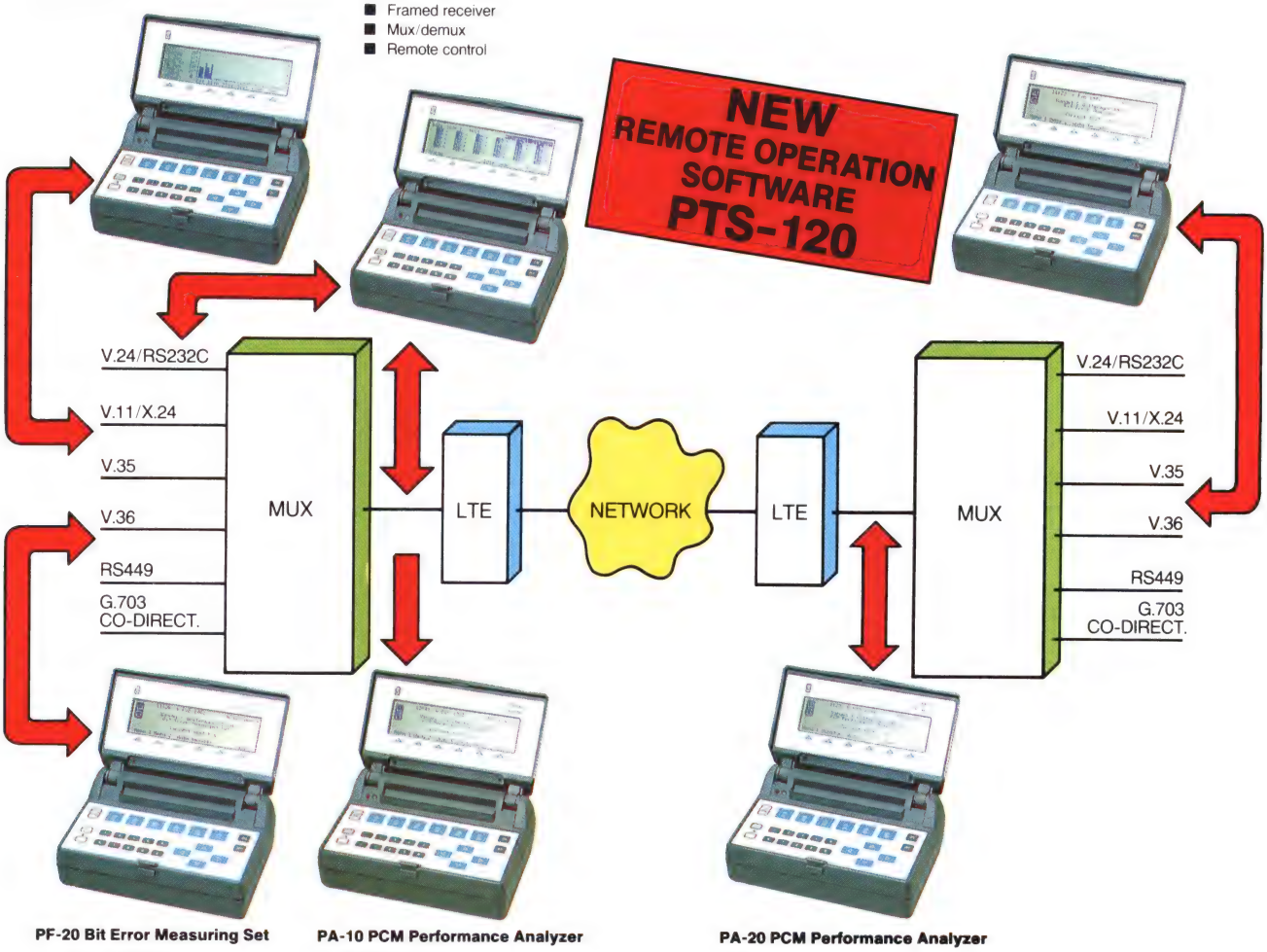

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Electronic Measurement Technology

Does Australia Need a National Information Policy?

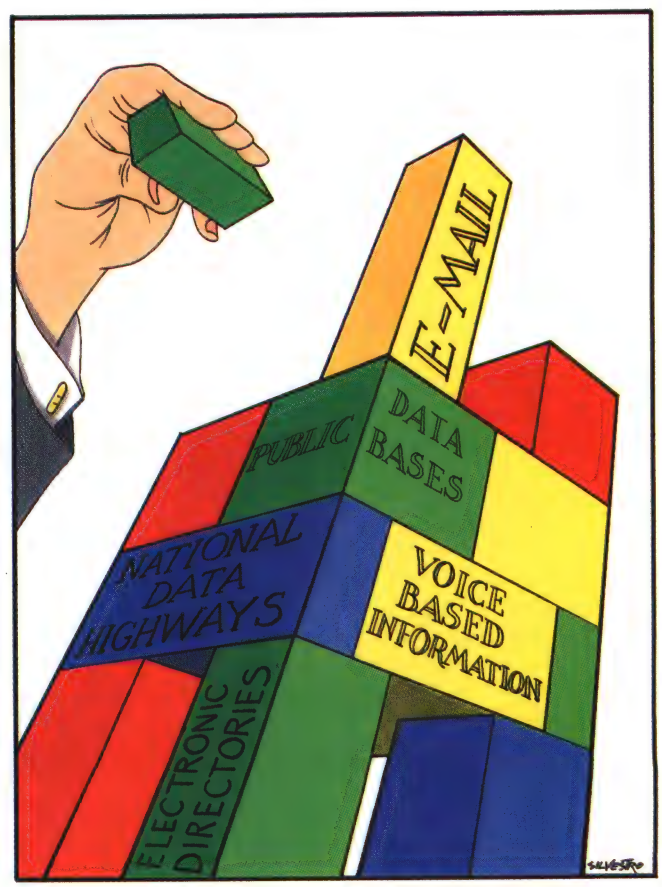
Stewart Fist examines what's involved in formulating a national policy to cover the emergence of a new era of information provision. Should we develop a US-style National Information Infrastructure initiative?

Since the provision and maintenance of telecommunications services is rapidly becoming a global rather than localised marketplace, we should take careful note of recent events in the United States. Firstly, the Clinton Administration is creating a 'data superhighway' — and they've put up the best part of a billion dollars to finance it. BT and News Corporation have signed an agreement to create a similar superhighway in Europe. Secondly, the world's largest ($91 billion) merger occurred between Bell Atlantic and Tele-Communications; US West and Time-Warner have also joined forces, and other cable-carrier mergers are in the wings. Thirdly, MCI and BT have signed an agreement to establish an integrated global network. This will counter AT&T, which is signing up other international carriers. Finally, Al Gore's task force has released a program to develop the National Information Infrastructure (NII).

These extraordinary activities probably represent (warning: cliches coming!) a 'paradigm shift' in US and international telecommunications — and the extension of telecommunications carriage into true 'Information Services.' We have here the beginnings of 'A New World Order' — the creation of our long-promised 'Information Society.'

But it's very hard to figure at the present time which direction this shifting paradigm is headed. On one hand there's a 'power to the people' movement, seeking the free-flow of information at both a research and public-access level, and on the other, there's increasing evidence of horizontal and vertical integration of unprecedented magnitude in the communications, information and entertainment industries. 'Convergence' is beginning to mean 'cartel.' 'Carriage' and 'content' are now confused. We've already seen Telecom joining forces with Kerry Packer and Rupert Murdoch in a Pay TV consortium, and the media moguls are buying up anything available with the avowed aim of establishing global media and communications conglomerates.

So the question: 'Should Australia have a National Information Policy (NIP)?' has taken on a new degree of urgency. Are we prepared to face the challenges of the new 'Information Society' in the 'Information Age'? Is information just like any other commercial commodity? Do we leave information control to the free flow of market forces? Do we allow vertical integration? Do we fight these international cartels, or join them? Is an American takeover of our information infrastructure inevitable? Does everyone have a 'right' to basic information resources? These are at least some of the questions that need to be considered.



"I feel as if Australia has missed the boat on similar things so often, that we do need an information policy," says economic columnist, Max Walsh. "What strikes me is the lack of education at the political level about what's happening out there. We've got this sense of isolation from the rest of the world; we sit back here and watch the great scramble that's occurring in the information industries, and we are not part of it. And the reason we are not part of it is that we have an old-fashioned tariff policy that didn't alert us to

The US NII Initiative: An Agenda for Action?

The US National Information Infrastructure (NII) document, which is subtitled 'Agenda for Action' was released for discussion by the White House on 15 September 1993. It is only 30 pages, and while it's rather short on details, it is broad in scope.

The document spells out a basic agenda for America (and not just the US Government) to construct 'a seamless web of communications networks, computers, databases, and consumer electronics that will put vast amounts of information at users' fingertips.' It purports to be a plan 'to unleash an information revolution that will change forever the way people live, work, and interact with each other.'

Possibly the most important new idea in the NII agenda is that it takes up and extends the concept of universal service. As the document puts it: '... to ensure that information resources are available to all at affordable prices. Because information means empowerment — and employment — the government has a duty to ensure that all Americans have access to the resources and job creation potential of the Information Age.'

In a way, Clinton and Gore are spelling out new telco Community Service Obligations (CSOs), but without putting the expanded load specifically on the telephone carriers. Who will have this responsibility has not yet been defined — although the US Government obviously sees itself as having a supervisory role here to ensure 'fairness.'

The two forms of electronic information specifically mentioned are:

- Enhanced access to government information: 'The Administration will seek to ensure that Federal agencies, in concert with State and local governments, use the NII to expand the information available to the public, ensuring that the immense reservoir of government information is available to the public easily and equitably;' and
- Library and school use of NII: application areas and projects which will be supported include 'government stimulus for connectivity and applications in health care, education, libraries and provision of government information.'

The emphasis is 'content,' rather than 'technology' oriented, although it recognises that the content can only be made available universally through the use of advanced electronic storage and communications technologies. In their confusion, they sometimes seem to suggest that this needs data superhighways.

As with all such documents, the NII paper has its required quota of cliches and platitudes: 'People could live almost anywhere they want, without foregoing opportunities for useful and fulfilling employment, by telecommuting to their offices through an electronic highway' and 'The best schools, teachers, and courses would be available to all students, without regard to geography, distance, resources, or disability.'

If Clinton and Gore honestly believe that electronic highways are going to solve unemployment, traffic jams, and second-rate teacher-training problems in one hit, then they've got a serious case of the techno-wanks.

'America's destiny is linked to our Information Infrastructure,' the document says. 'Americans can harness this technology to:

- Create jobs, spur growth and foster US technological leadership;
- Reduce health care costs while increasing the quality of service in underserved areas;
- Deliver higher-quality, lower-cost government services;
- Prepare our children for the fast-paced workplace of the 21st century; and
- Build a more open and participatory democracy at all levels of government.'

You can see that they have their sights set high.

There's quite a bit of jollying-up of the IT mafia in the document. The government's agenda includes promoting 'private sector investment, through appropriate tax and regulatory policies,' and it purports to see most government activity and involvement in the area as only being to 'complement and enhance the efforts of the private sector.' In other words, they are promising to do all this without substantially increasing taxes.

In order to give the document some credibility as a action-plan rather than just policy discussion, the authors have peppered the paper with 'Action' statements. The key ones are:

- 'Action: Passage of communications reform legislation.' They aim to break up cable and telephone monopolies;
- 'Action: Revision of tax policies.' Tax incentives to spur private sector investment in the NII;
- 'Action: Develop a new concept of universal service.' To determine how this new concept will be extended and applied;
- 'Action: Continue the High-Performance Computing and Communications Program.' This is to expand the Internet into a data superhighway;
- 'Action: Implement the NII Pilot Project Program.' Funding is provided for network pilots and demonstration projects, with matching grants to state and local governments;
- 'Action: Inventory NII Applications Projects.' To establish an electronic forum and to publish project information about the success/problems of the NII pilot;
- 'Action: Review and clarify the standards process to speed NII applications.' Recognition that new technical standards will need to be developed for the exchange of information;
- 'Action: Review and reform government regulations.' Change those that impede development of interactive services and applications.

There are many subsidiary Action programs also, including review of: privacy concerns; encryption; network reliability and vulnerability; allocation of spectrum; copyright laws; reimbursement of copyright owners; trade regulations; and accessibility of government information.

The document also throws in a few naive predictions that the NII will create $US300 billion a year in economic growth (across all industries), and provide a direct boost to the GDP of between $US194 and $US321 billion by 2007. It will also create as many as 300,000 jobs in the next 10-15 years, it promises.

You can obtain the full document over the Internet by sending a mail message to ace.esuda.gov. You don't place anything in the message, but the White House will respond by sending the whole document.

Stewart Fist

the arrival of the high-tech era. Now we are being excluded from the convergence of these industries because of our political constraints. The politicians don't understand the implications, or the speed at which things are moving in this industry."

Anyone who's studied the history of the Oil Trusts of the late 1880s, and the global chicanery of the Seven Sisters of the international oil/petroleum business, will recognise that the current merger and cartel formation in telecommunications is history repeating itself.

And, as at the turn of the century, there's a prevailing political attitude of 'letting the market decide.'

Similarly in the film industry: Hollywood and a couple of UK cartels virtually controlled the English-speaking world's cinema industries until the 1970s through vertical integration and international distribution consortia. They owned the stars, the studios, the distribution companies and the cinemas — and in Australia they killed

a thriving film industry which, at one time, was the fourth most productive in the world.

So you'd have to be pretty naive not to see the threat now coming in telecommunications and in the new information sector. There's a pretty good case for getting our house in order before these problems become critical. If there is to be a 'paradigm shift,' it will be in global ownership and control rather than in the technology.

"It seems to me that the information superhighway thing is being pushed pretty hard in the States," says commentator Phillip Adams, "and it's being pushed, just as Star Wars was pushed, by people whose financial interests are best served — the equipment manufacturers and the carriers, who can see a quid in it. And if a sceptic comes along and says: 'This is going to cost *X* billion dollars, but what's the social advantage?' he'd be howled down by a chorus of PR apparatchiks, and made to sound like a Luddite."

"You can't leave decisions of this importance to the market to decide," he says. "If you were to wander through the boardrooms [of the telcos and broadcasters], you'd quickly get very depressed. The directors and managers of these companies are very very dull and narrow people; they don't read, and they don't think about or discuss ideas. Which is a strong argument against information policy being driven by free market forces — not because they are Machiavellian, but because the captains of industry are often asleep."

National Information Policy

At a national policy level, we need some sort of National Information Policy (NIP) to settle questions of vertical and horizontal integration and control; to deal with copyright and privacy issues; to encourage information flows in the business community; and to develop a new 'Information Sector.'

But within these broad policy issues, there need to be more practical plans along the lines of the Clinton Administration's proposal to establish a National Information Infrastructure. Any discussion needs to include telecommunications and broadcasting/convergence as peripheral issues, but it must concentrate on the provision of useful information, not just on the carriage of information/entertainment.

In the US, these discussions have become confused because Clinton's NII proposal includes data superhighways for research organisations, medical imaging, big business, and so on, while also emphasising the need for new 'universal services' — which are generally held to mean e-mail, text-, fax- and voice-based information resources for the whole community, which are at the other end of the bandwidth scale.

Those who have been pushing an information policy line for many years find it difficult to comprehend why the need for government action on policy isn't patently obvious to everyone. But it isn't. And there are both legitimate issues (like privacy and copyright complications) and illegitimate and self-serving reasons why this matter doesn't have a high priority in Canberra.

Grasping New Paradigms

The House of Representatives Standing Committee on Long-Term Strategies' report published in May 1991 is rather pretentiously entitled: *Australia as an Information Society: Grasping New Paradigms*. However, this inquiry was possibly a world-first for Australia. No other country at that time had the foresight to ask a bi-partisan committee to determine the needs of a National Information Policy. It could have been the beginning of a new information-industry sector in the economy.

An Australian National Information Policy

In May, 1991 the House of Representatives Standing Committee for Long-Term Strategies produced a document called *Australia as an Information Society: Grasping New Paradigms* as an attempt to outline an agenda for an Australian National Information Policy (NIP). The committee was chaired by Labor politician, Barry Jones — and obviously a large part of the document was written by him. It follows a decade behind his book, *Sleepers, Wake!*.

So, you would expect a Labor Government, with Jones as its President (a well-known world expert on the subject) to have had a two year head-start over the Americans in formulating a NIP.

Dream on! The Government is still trying to come to grips with the idea that text messages can be sent over phone lines rather than via cleft stick, and the Liberals are still arguing about whether cleft sticks should be privately or publicly owned.

The committee considered three questions: the need for a National Information Policy; the future of libraries; and information issues in the context of Parliamentary decision-making. The report clearly distinguishes between IT technology and information 'as content' and it goes further in stressing that the purpose of an information infrastructure isn't just to collect and distribute data — it is also important to provide for the extraction of useful information from that data.

But where the Australian report falls down in pragmatic terms, is that it only provides a discussion framework, while the US NII document purports to be a plan of action.

The Australian committee's idea of a National Information Policy also encompasses print (books, newspapers and magazines) and the various institutions like schools, libraries and museums — while the American document is more focused and deals with electronic 'infrastructure' only.

However, *Paradigms* shows a better grasp of the realities of information resources in the community: 'In a global economy, with traditional barriers becoming obsolete, industrial strategy will be increasingly dependent on access to information about the size and location of markets, assessing consumer feedback, scientific discoveries and technological innovation, changes in style, fashion and design skills, the implication of various factors (economic, social, environmental, political, cultural) determining consumer demand and preference, the impact of transborder data flows, and access to information about price and currency fluctuations in real-time.'

'Information policy and industrial policy have to deal with the same issues — efficient use of resources, innovation, international competitiveness and growth — in the same industries.' This is a bit more specific than generalities about the supposed joys of telecommuting.

It identified issues that needed to be addressed in an information policy:

- Information disadvantage — specifically the growing disparity between the 'information rich' and the 'information poor.'
- Information as a commodity — when should information be regarded as a 'free' and when and on what basis should it be charged for?
- Implications of integration — should these systems be allowed to be vertically integrated or be under political control?
- Economic significance — how does the information sector differ from other commodities or resources in economic analysis?
- The integrity of information, and issues of privacy and public access.

In its conclusions, the document reveals its weaknesses. It proposes no specific actions, but consists of numerous motherhood statements: 'encouraging industry to become active users of existing information . . . developing strategies to facilitate the transition . . . increasing the status of information provision . . .' etc. It makes interesting reading and it covers a lot of territory. However, like the proverbial Chinese take-away meal, it leaves one wanting more.

Stewart Fist

But equally, few other countries would have ignored such a report so profoundly after publication. The political yield from this inquiry was precisely zero.

A relatively large number of the 121 submissions to the inquiry were either opposed to the idea of a NIP, or extremely wary of its possible outcomes. As the report grudgingly admits: 'The submissions did not contain unanimous support . . .' and the most vocal opposition to the idea came from government departments — although various Ministries also contributed their quota of paranoia and ignorance.

The reason for this, according to Bill Melody of the Melbourne-based Centre for International Research on Communication and Information Technologies (CIRCIT), is that: "the Parliamentary countries — those following British traditions — have a much stronger tradition of secrecy, both on the part of the government and on the part of corporations and the elite. There is a major difference between the openness you find in the US, and that of most other major countries. And, in my experience, Australia is even worse than Canada and UK."

There's little doubt that both politicians and bureaucrats were worried about problems that might arise if they had to spell out, and conform to, an information policy — they saw this as something akin to the dreaded *Freedom of Information (FOI) Act* rather than a guide to establishing economic and cultural directions.

Whatever a 'smart country' is, we can be certain that we are a long way from it. As Barry Jones, who chaired the Standing Committee, points out:

"If you look at the OECD's comparison of the economic growth in its 12 member states, the fastest growing sectors are all in 'computers and electronics' — except for Australia, where it is 'real estate'."

But Barry Jones strongly believes that information itself has an export potential even greater than IT. "One of the most likely areas open for Australian development is in information-based industries and services," he says. "Presently, our contribution to information exports is piffling. In the Asia-Pacific area, Australia, with its language and education base, is well placed to provide sophisticated services in education, translation and business services, banking, insurance, research, medicine, entertainment and telecommunications."

"Information as a subject area is fragmented to a ridiculous degree in the Federal Government, and nobody takes responsibility for it," Jones complains. Obviously no one in Canberra thinks of 'information' as a useful and saleable commodity — as industry or infrastructure. Fortunately, until recently, this has been the same in most of the countries with which we compete; but we can't find comfort in this fact in the future.

If you believe John Naisbitt (*Megatrends*, 1984) and other assorted gurus, we've suddenly been thrust into a new world — characterised as 'Post-industrial' or an 'Information Society' — where information is more important than products, services or cash. We must already be 10 years into this change, since Naisbitt and Toffler were both writing back in the early 1980s.

'We now mass-produce information the way we used to mass-produce cars,' Naisbitt says in *Megatrends*. 'In the information society, we have systematised the production of knowledge and amplified our brainpower. To use an industrial metaphor, we now mass-produce knowledge and this knowledge is the driving force of our economy. The new source of power is not money in the hands of a few, but information in the hands of the many.'

One might have reservations about all this philosophical 'Information Age' stuff — is it just tabloid sensationalism under a pseudo-academic cloak? After all, information's central importance is not a new discovery, and there is little evidence that the 'perceived' pace of change is faster now than it has been over the last hundred years. The arrival of the Information Society represents an evolutionary, rather than revolutionary, change to our culture.

If one was to identify the time in recent history where citizens faced most 'Future Shock' then it would have to be the 1890s and early 1900s. This was when Bell invented the telephone; Edison the light bulb and phonograph; still photography and the movies became popular; Marconi and De Forrest created radio; and trams, buses, cars, trucks and aeroplanes replaced the horse and carriage. All of these technologies had a direct, disruptive and rapid effect on the way people lived, worked and played. It is hard to think of anything comparable in the last twenty years.

In fact, by comparison, the computer and fibre revolution has been rather benign because the technologists placed considerable emphasis on 'user-friendliness' and on the 'transparency' of applications. All the 'Information Society' propaganda could actually be a barrier to the formulation of intelligent policy on these issues, because the term cloaks the subject with a degree of esoteric mystification. Then politicians feel out of their depth, and shunt it into the 'too hard' basket. Barry Jones, in his book *Sleepers, Wake!* (1982), tried to put these concepts into a more intelligent context, without falling into the 'Brave New World' trap. But worldwide there's been a development of what can only be described as 'The Cult of Information.'

Towards a Brave New Policy

We need to consider these issues with a view to formulating policy — the evidence of rapid change in the information power structure is now inescapable. One suspects that Australia's parliamentary Blinky Bills are bound to take some notice soon, if only because Uncle Sam has made a 'National Information Policy' respectable. Perhaps even essential.

So 1994 could well be the year where the 'paradigm shift' occurs — not for any technological reasons — but because, finally, the politicos have woken up to the implications. Like most sudden changes, the results could be dangerous — if only because the politicians might start jumping on and off only half-understood technological bandwagons.

Knowledge vs Data

It's interesting that Naisbitt (and many other gurus and disciples) fails to differentiate between information and knowledge. It's a common problem, along with the confusion between the information technology and the information itself.

In an attempt to create a standardised terminology here, we could class 'information' as organised and systematised 'data,' which can be in a library or in IT-based computer memory. You cull and correlate data to produce information. But 'knowledge' is something that only humans can have: "Knowledge doesn't reside in a book, a databank, a software program; they only contain information. Knowledge is always embodied in a person," says management guru, Peter Drucker.

Fred Jevons, Professor of Science and Technology Policy at Murdoch University, makes a similar distinction when he questions the need for 'more' rather than 'better' information — an assumption that seems to be embodied in many of the productivity claims for wider and wider bandwidth (data superhighways) "Most of us already suffer from information overload — we don't want more information, we want selective information," he says. "Clinton's NII proposal is all very technophile, and it assumes that everything about information technology is good. There's very little recognition of any of the difficulties."

But information overload might only be true of the high level research workers. It's difficult to accept that there's still no simple way (paper or electronic directory) to find such 'data' as the fax number or e-mail address of a company in Australia — without contacting them first. So both data and information are required — and it is often the low-level ubiquitous data held in directories and lists which is the most productive and valuable in a community.

Peter Drucker, who is much less given to philosophical overstatement than Naisbitt, also emphasises the 'data/information' distinction and in his latest book (*Post-Capitalist Society*) he stresses the importance of information policy directed towards increasing knowledge-yield: 'Be-

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cause knowledges [coordinated knowledge] are so specialised we also need a process to turn this potential into performance. Otherwise, most of the available knowledge will not become productive; it will remain mere information,' he says. This is not just because esoteric academic theses remain unread, but because millions of items of 'useful' basic information have no ready means of distribution.

Because information is intangible, ubiquitous and diffuse, it is often difficult for it to be identified and re-used by others in the community — so the Australian society spends much of its time 'reinventing the knowledge-wheel.' It's as if every new home-builder had to make their own bricks, because there was no way of finding the brick-maker, and no way of having bricks delivered to the building site.

With every new business, with every change of job, with every new project, the same data is often being culled to produce the same 'information' over and over again. And since nearly 70% of us are now 'knowledge' workers, this represents national productivity inefficiencies on a grand scale — and, also, quite probably, the most promising avenue for micro-economic reform.

According to Drucker, it's not good enough just to have knowledge — you've also got to have the structures in place that allow that knowledge to be applied efficiently within the society as a whole.

'[In the future] the productivity of knowledge is going to be the determining factor in the competitive position of a company, an industry, a country. No country, industry, or company has any natural advantage or disadvantage. The only advantage it can possess is the ability to exploit universally available knowledge. The only thing that increasingly will matter in national as in international economics, is management's performance in making knowledge productive.'

So there's a need for countries and companies to develop ways to share information resources in the community, and to increase 'knowledge' productivity — and this is primarily what information policy is all about. In essence, we've go to create both the open marketplace for information (with simple billing systems) and the communications networks to deliver this useful information at the lowest possible cost.

Time for a Change

Despite a history of lack of interest in this area, the Australian government's view on information policy and strategy may be about to change. After all, the US is the home of laissez faire deregulation, economic rationalism and the First Amendment — and when Big Brother decides that it is time for the government to become involved in making information easily and cheaply available to the public, Australia will most certainly follow.

Stirring this pot in the US, is the Clinton Administration's document 'National Information Infrastructure (NII): Agenda for Action' which establishes a couple of task forces, and sets some (albeit rather confused) action plans to get this process underway. If there really is a 'paradigm shift' from IT to information, then this should mark the start of the new era.

Clinton's NII Action Task Forces are likely to succeed where the Australian 'Paradigms' committee failed, because their recommendations won't come encumbered with business and bureaucratic fears of potential industrial, government, broadcasting and media control. In fact the opposite is the case; Clinton seems to be deregulating cable and telecommunications, and in the process he's creating a massive free-for-all scramble for media assets and dominance. And there's nothing quicker able to change a 'public-access philosophy' into 'legitimate business prospects' than a good dose of corporate greed.

The NII proposal has a narrower focus on questions of 'electronic infrastructure' than the Paradigms document, which dealt with wider issues of policy. The American task forces are concentrating on getting electronic systems up and running, and making them available to schools, small business and the public at large. But there's certainly a large overlap between the two documents, and striking parallels between many of the questions considered.

We shouldn't confuse the NII's 'infrastructure' concept with Al Gore's data superhighway or with interactive video-dial-tone — although all will eventually merge. The superhighway project is for research, medical and corporate requirements, but also later for education and larger businesses where bandwidth is often required (see 'NREN — Setting the Network Clock to Fast Forward,' *Australian Communications*, November 1992).

Video dial-tone and video-over-copper/fibre to the home are all 'entertainment-oriented' plans which are contributing to the current euphoria, and boosting the feeding frenzy of mergers and buy-outs. But they are not central to the NII's infrastructure, or even necessary for 'universal service.'

The data superhighway is probably closer to reality than Pay TV over ADSL or fibre-to-the-home. The superhighway was originally an expansion of the old research-based Internet, creating the NREN (National Research and Education Network). Now the concept has spread even wider — sometimes including the 'entertainment' aspects, and sometimes not. The NII discussion document mixes these concepts in a rather confused and confusing way.

Universal Service

What is new here is the idea of 'universal service' for information, rather than just for telephony — the idea that everyone has the right to be able to easily and cheaply select from a range of useful public information, and have access to some privately sold information, using public-access networks.

The 'universal services' concept, however, counter-balances the superhighway's high-bandwidth emphasis by emphasising the value of the lower-level 'information for the people' resources which will most certainly be delivered initially by e-mail, fax and voice-telephony.

Despite initial reservations about the private-sector involvement, Clinton's proposals for the data superhighway were eventually supported by education, library and research organisations, because it appears to provide such massive funding to the Internet/NREN. It was opposed by the telephone companies (particularly the RBOCs) because it challenged their monopolies, and created the potential for government interference in network business — they wanted the government to fund universities and schools to rent normal networking facilities from them.

Corporate Interest

Although supposedly strapped for cash, the Clinton Administration seems determined to push ahead with the NII, and intends to fund these developments by using tax incentives and private sector involvement. To compensate the RBOCs, it has partially released them from some restrictions on owning cable systems and databases. This might eventually create enormously powerful monopoly carriers with vertical integration, or could result in competitive networks — toss a coin and take your pick.

The cable companies are buying into 'information software' businesses (mainly database utilities and film distribution) also, and this too could create problems. Enormous market power could be exerted through vertically integrated corporations and alliances responsible for making TV programs, acquiring and storing database information, and delivering information and entertainment over new monopoly networks to users.

As *The Economist* correctly points out, 'governments should always be wary of alliances among industries with a history of monopolistic practices.'

And many critics find it hard to see how Clinton can reconcile 'cheap ubiquitous information services for all' with the private sector's desire for profits, especially where cross-subsidies from telephone services can be used to drive out competition. After all, the provision of universal e-mail and cheap database access does not depend on any recently-invented technology — the carriers have been able to offer cheap low-bandwidth text communications to casual users for 10 or more years — but have chosen not to.

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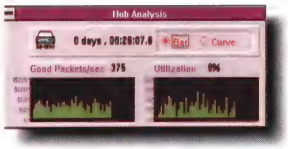

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The telcos' problems come about because they've been unable to work out how to maintain their high-profit margins with services like e-mail and electronic directories — the reason, no doubt, why this new proposal is called 'infrastructure' — rather than 'business gold-mine.' Unless the public data or the e-mail services are very cheap to access and easy to use, they will not be utilised. Cost and convenience are the most important public-access considerations.

'Private enterprise has no serious interest in serving the public good, which is the NREN's mission,' the most vocal US critics say. And they complain that private enterprise desires to 'exercise oligopoly control over Research and Education (R&E) traffic and convert the NREN community into a consumer market for commercial products.'

How cheaply these networks can be run is illustrated by the fact that public support of the present Internet/NSFnet backbone currently costs the US government only about $US18 million a year, which is a fraction of the cost of the whole billion-plus dollar superhighway program.

Government Directions

Clinton's superhighway immediately attracted Australian political attention of the 'me-too' kind, but the NREN seems to have been totally confused here with fibre-to-the-home, which then became another made-on-the-run government policy expounded by Prime Minister Keating — possibly for its potential to extract the government from its digital-Pay-TV-over-satellite fiasco. It's obvious that in Canberra, Digital + Fibre = 'The Wave of the Future' — despite growing evidence that low-cost, high capacity, interactive SHF radio transmission may keep glass out of suburban streets until well into the next century.

There's a danger here also of the Australian Government confusing carriage with content, and seeing this latest NII document only in the light of a wideband research network. In fact, Clinton's vision of the NII's 'universal service' is of a combined Internet, CompuServe and Dialog database utility, made available for the masses over standard telephone lines — primarily for adults, kids, non-profit organisations and small businesses. The document doesn't emphasise data superhighways for the jet-propelled, so much as data footpaths along which everyone can wander.

But Bill Melody disagrees with these assumptions about Clinton's 'universal service' intentions; he's much more cynical. "What's driving the NII is special interests. They are funding the frontier, not funding the floor," he says. "The NII is being driven by things other than information policy issues — other than ensuring citizens have the right to some basic communications and the right to access a wide range of information. They seem to be putting forward an economic argument, saying: 'If we just subsidise sophisticated research development and high-level computer users — this will help pull this industry along, and eventually these effects will filter down to society'."

Melody agrees that it is primarily the low-level services that are needed: "If we examine what drives society's economic and social relations, and what kinds of communications we are now dependent on, you have to say that our social options are dictated more and more by electronic communications," he says. "But there's very little in the proposal that really benefits the public at large — that benefits Joe Bloggs the citizen, or Joe Bloggs the consumer — except, perhaps, this concept of 'universal service'."

Information For All

The NII document extends the idea of universal service to include ready and cheap access to a wide range of government and general information, rather than just a telephone communications service.

Dr Pekka Tarjanne, Secretary-General of the ITU, recently took a similar line when he pointed to Article 19 of the Universal Declaration of Human Rights, which says that everyone should have, 'the freedom to seek, receive and impart information and ideas through any media and regardless of any frontiers.' The concept of having access to information and ideas is an essential part of a universal telecommunications service, he proposed — it is not just access to voice communications.

In Australia, Bill Melody is also concerned that rural residents and other disadvantaged groups may find themselves even more disadvantaged in the future: "The more our society depends on electronic networks, the more everyone needs to have access, or they are not part of the social or economic networks," he contests. "So you could perhaps make a case that network access should be free to everybody, and that the revenue should be raised entirely from network transaction costs." He points out that universal service definitions have undergone change over the years: "About 10 years ago fax wasn't part of universal services, but now it is," he says.

There's actually nothing dramatically new in widening the concept of universal service. Australia already has broadcasting regulations which specify that everyone, everywhere, must have equal access to four channels of entertainment television. Governments have obviously seen our right to watch *Baywatch Bimbos* and the like as more important than our need to access an electronic fax directory or send e-mail.

We now face the task of learning to handle the provision of information access (eventually) to 16 million people, and so we will need new standards to make this happen as transparently as possible. We'll also need to invent new equipment, such as centralised multi-gigabyte storage devices capable of being accessed simultaneously by thousands of phone lines, and we will need kiosk-style coin-in-the-slot data-payphones, because not everyone will have home access to PCs and modems.

Then there are questions of cost, copyright, privacy issues — and a thousand other problems along a similar vein. "The question of information policy is more in asking: 'If people are to function in a political democracy as participants, as consumers, as workers; what kind of communications and information do they need to function properly in those roles?' And that goes to the heart of information itself," says Melody.

Melody points out that content-services can be developed in either of two ways: with few subscribers paying a high price for the specialist information — or with many subscribers each paying only low prices for generally-useful information. The first approach has given us our current research-oriented database utilities costing $100 per hour, while the second is where the NII's universal services concept is heading.

But equally obviously, if information is to become readily available at very low cost to the community at large, then very substantial pump-priming funding is likely to be needed. Public databases require most of the costs to be expended up-front. You need a mass of information, and the range must be extraordinarily wide (and useful), before you'll encourage people to buy the modems and invest the time and frustration in learning how to use the system.

So we should expect that such a facility will not be financially viable for a good many years; information systems only become useful and usable when they are consistently helpful — you need to get a 'strike' almost every time you try. And to encourage mass usage, you've got to keep the access charges low, which then adds to the initial financial burden.

Eventually, however, with mass public access, the economics will begin to change. But this is not the type of cash-flow projection which attracts private investment — so it's hard to see how Australia can make this change without the involvement of a government business enterprise.

No society will develop mass-usage of e-mail or information retrieval overnight — and the problem isn't just the lack of home PCs or modems, or the complexity of electronic communications (but this certainly doesn't help). If we are going to break the current bonds of technophobia in the community, the incentive must exist for people to develop regular usage patterns of highly-useful and productive electronic services.

Stewart Fist is a freelance journalist based in Lindfield (NSW).

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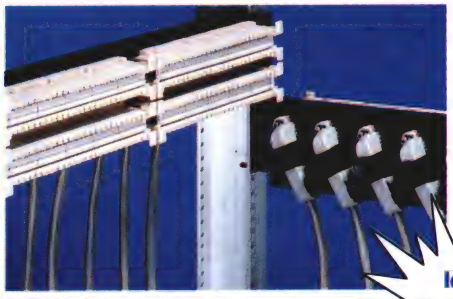

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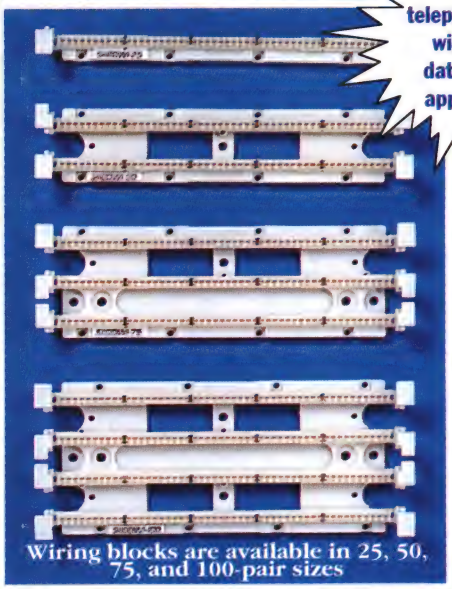

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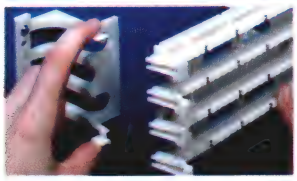

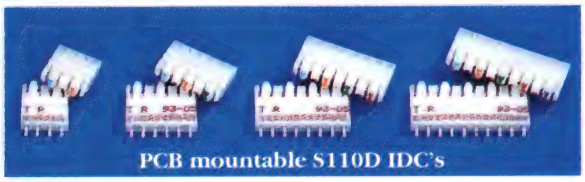

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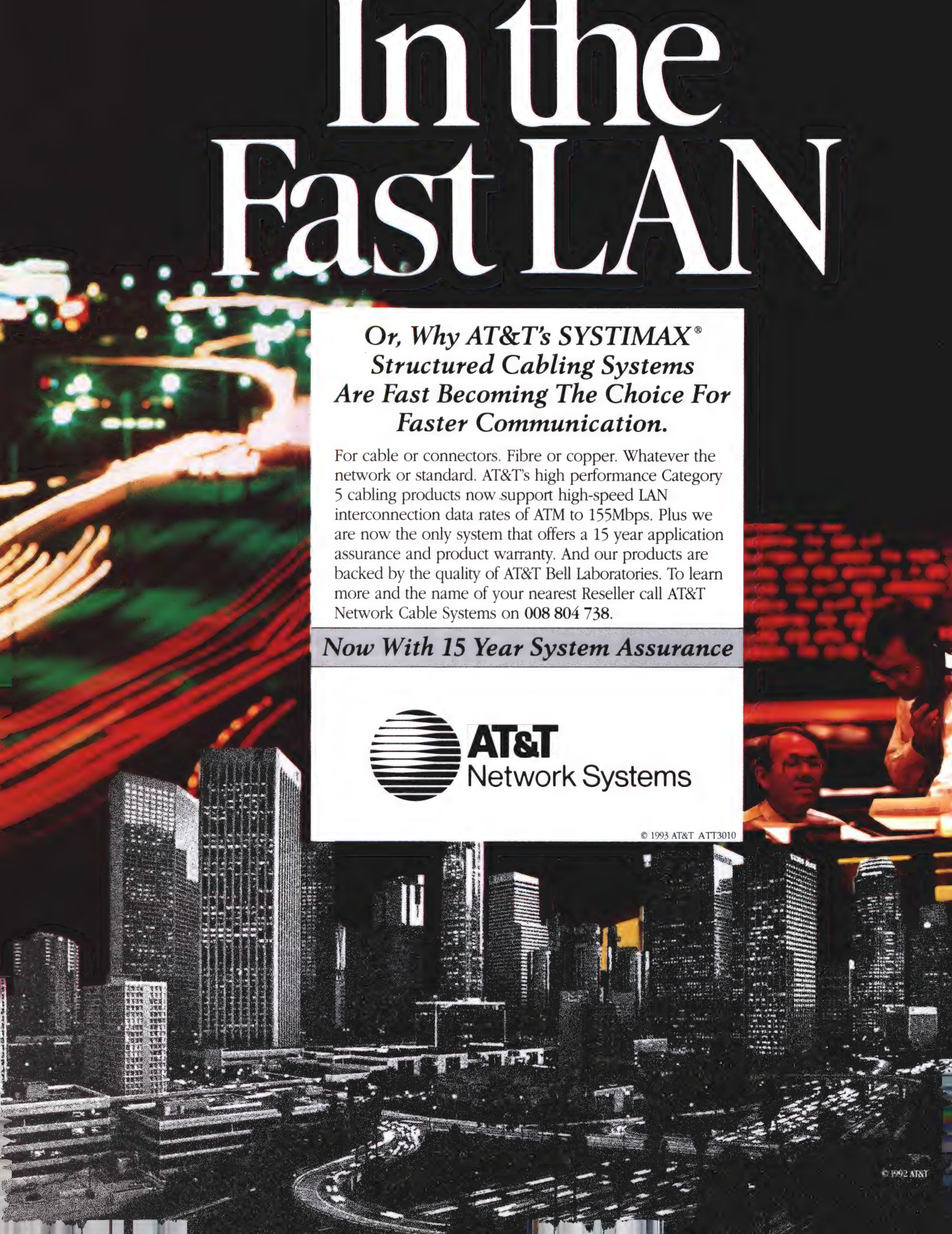
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NetWare 4.0: The Work Behind the Network

Hands-on testing shows that cranking up NetWare for the enterprise takes a lot of planning, hard work, and patience. Network designers must now deal with a host of new performance issues.

The first flashing electrical sign to light up Broadway duly amazed strollers along New York's Great White Way. What the promenading guys and dolls did not know was that the flash had more to do with elbow grease than ingenuity: to keep the sign's many light bulbs blinking in unison, workers stood behind the display and threw a large mechanical switch on and off repeatedly.

Network planners and managers who set out to deploy NetWare 4.0 for enterprise networks have something in common with those early technology enablers. While user departments gawk at the impressive list of performance improvements promised by Novell — corporate-wide connectivity, easier workstation upgrades, and better disk and memory management, to name a few — administrators are finding out that the only way to get those benefits is to roll up their shirtsleeves and get ready for some heavy duty work. The potential rewards for their efforts are great — once it's up and running, NetWare 4.0 will deliver the enterprise-wide connectivity that has eluded LAN users for years.

By now, the main attractions of NetWare 4.0 have been well documented. But to find out exactly how much blood, sweat, and toil NetWare 4.0 can exact, US systems integrator LAN Systems embarked on an extensive investigation of the would-be enterprise operating system. The analysis involved not only an in-depth reading of NetWare 4.0's extensive documentation and interviews with Novell insiders, but also the installation and operation of a prototype NetWare 4.0 network comprising several departmental servers.

Several months of poking and prodding have yielded one firm conclusion about Novell's new network operating system: NetWare 4.0 is a completely different animal from earlier NetWare incarnations. Any organisation that tries to move from workgroup NetWare installations to 4.0's enterprise framework without doing some meticulous planning and prototyping is playing with serious fire.

Pillar of Strength

The main source of NetWare 4.0's enterprise networking strength is NetWare Directory Services. NDS lets users anywhere on an enterprise network locate and gain access to any other network resource. In essence, it enables network administrators to unite multiple workgroups so that users can access resources outside their workgroup as easily they can get their own. In essence NetWare 4.0 creates a universal workgroup that encompasses the separate workgroups that existed under previous NetWare versions.

This ultimate vision of one big happy network carries some enormous implications for network planners. Some of them are logistical: for instance, planners must carefully plot a complete map of the enterprise network, making sure that each part of the network has a unique network name or identifier. Designers of enterprise networks must also partition the network's directory with an eye toward minimising traffic volume on lower-speed WAN links. Some implications are technical: to ensure NDS's integrity across all servers in the network, planners may find themselves having to implement a custom system (as opposed to the default system that

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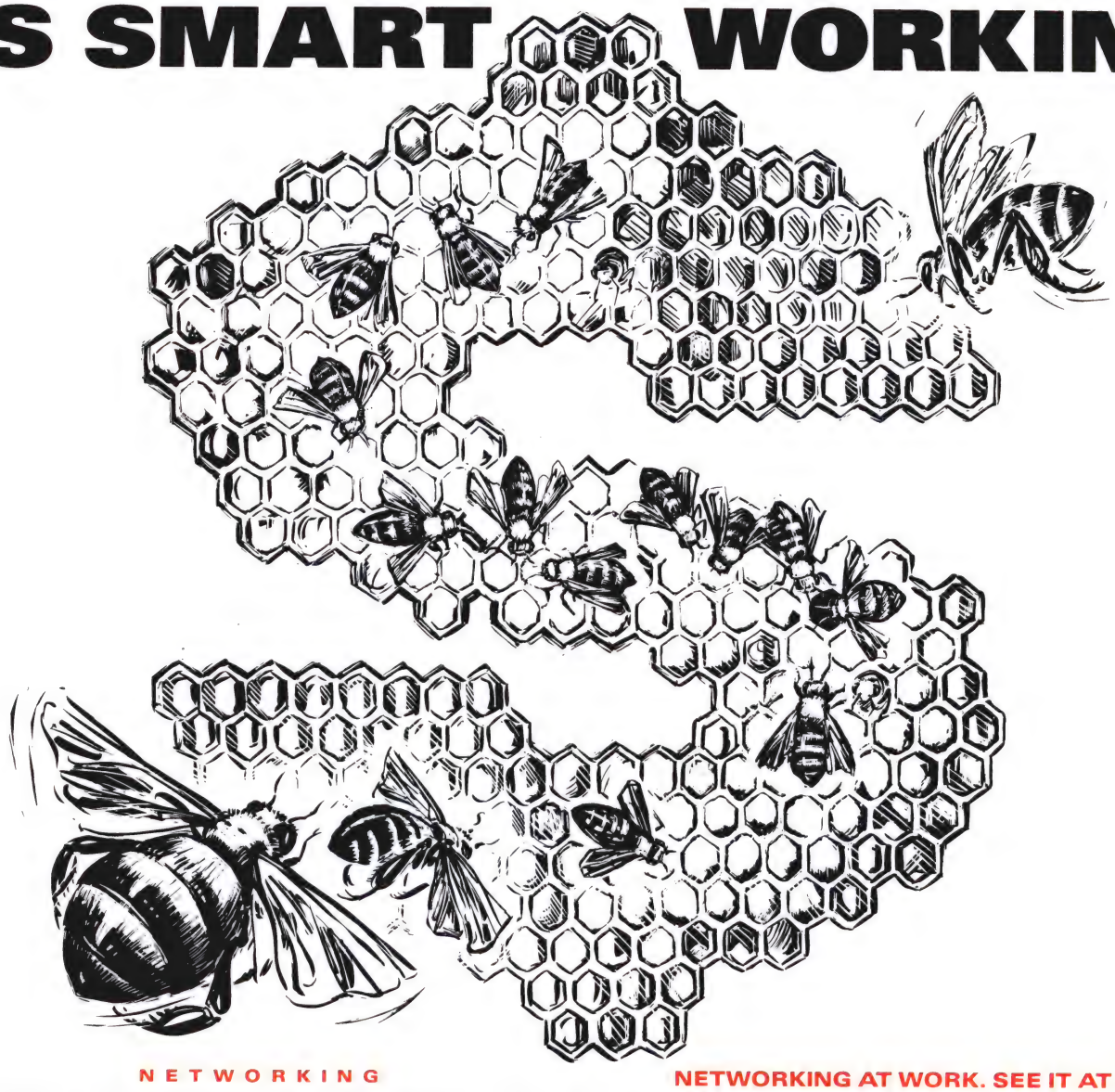

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comes with NetWare 4.0) to keep those servers synchronised so that updates and changes are delivered across the network in proper sequence. And some are political: the most carefully planned network will fail if individual departments decide not to go along with the scheme.

By putting NetWare 4.0 through all its paces, evaluators at LAN Systems uncovered several helpful features — and some potential pitfalls — that can affect the transition from workgroup to enterprise NetWare. Utilities in NetWare 4.0 are different enough from earlier versions to require at least some retraining for network operators. With 4.0, Novell has quietly but unmistakably shifted its approach to workstation software, forsaking its previously used dedicated IPX drivers for the protocol-independent Open Data-link Interface (ODI) structure. One of ODI's key benefits for enterprise networks is that it enables network software at the workstation to be upgraded more easily.

On the downside, evaluators at LAN Systems found out that some NLMs built for earlier NetWare versions do not work with NetWare 4.0. Novell had promised that all NetWare-certified NLMs would work because NetWare 4.0 emulates all NetWare 3.X library calls. Surprisingly, many of Novell's own NLMs aren't officially certified, and they don't work either. Novell has made changes to its Storage Management System (SMS) application program interfaces to accommodate NDS, so NLMs written to these APIs must be updated.

Plan to Plan

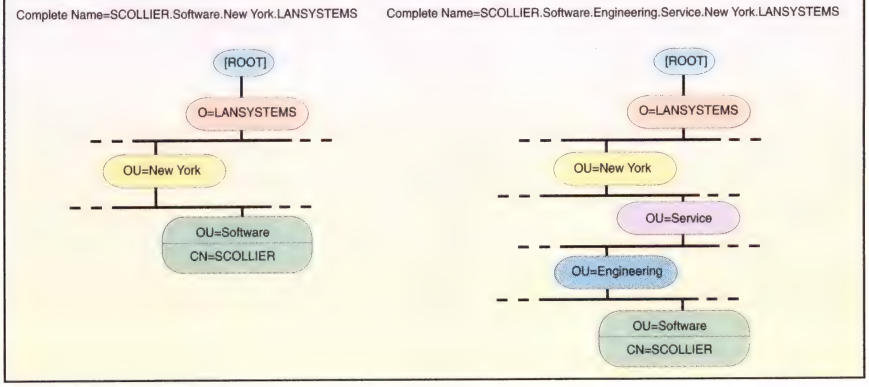
It's no surprise that NetWare 4.0 requires a lot more planning than earlier NetWare releases; after all, before 4.0 NetWare was a workgroup-orientated operating system. Users requiring access to multiple servers had to establish separate user IDs with each of those servers. With previous versions of NetWare, planning usually didn't have to go beyond figuring out memory requirements with worksheets supplied by Novell, deciding whether to upgrade the server software over the network or from floppy disks, and finding the time when the upgrade could be done without affecting users.

To set up NetWare 4.0 as an enterprise operating system, planners first should develop a blueprint for building an efficient network hierarchy that accounts for resources to be linked. The primary tool for creating this is NDS, a distributed database that includes all network objects and their associated organisational units.

NDS is not a plug-and-play service — network architects must not only develop a complete model for the NDS directory tree but also decide how to partition the NDS database among different network servers to ensure fault tolerance and to ensure that information is stored as close to primary users as possible. Directories that are partitioned or replicated haphazardly can degrade response times and add unnecessary traffic to the network.

The NetWare Tree, Branch by Branch

With NetWare Directory Services, network administrators can create directory trees comprising any number of branches, with each branch representing a different organisational unit.



Because the overall design and configuration of the directory can have such a dramatic effect on network performance and manageability, planners need to go beyond the blueprint stage and build preproduction prototype networks for their installations. The main purpose of the prototype is to fine-tune NDS and the time synchronisation service that coordinates changes to the directory. The prototype also can be useful for learning about NetWare 4.0's new utilities and features, although these can be dealt with once the full network is up without jeopardising operations.

In a prototype network, it's possible to link servers over a single Ethernet segment and still observe (via a protocol analyser) the amount of directory update traffic exchanged between them. This kind of observation is important, since in its NetWare 4.0 documentation Novell does not offer any formulas for calculating the amount of traffic that will be generated by specific actions.

NDS Basics

Depending on the scope of a given network, the amount of traffic generated by NDS can be significant. Ultimately, NDS makes it much easier for users to find and access network resources wherever they may be located. Achieving this kind of universal workgroup adds some network overhead, however. The goal in setting up a prototype is to figure out how to minimise that overhead, especially where high-cost and low-bandwidth WAN links are concerned.

Under previous versions of NetWare, users had access only to resources directly connected to their server. Any user who needed resources from another server had to log in separately to that server — assuming, of course, that access rights were granted and that the user understood the naming conventions of the remote server. For network administrators, each server had to be cared for as a separate entity.

Under NDS, changes are entered once and automatically sent throughout the network. NetWare 4.0 could be configured to let departmental managers maintain their own server partitions as in the past, but doing so defeats the purpose of using NetWare as an enterprise-wide operating system.

The NDS directory is a set of network objects, including users, printers, servers, and other resources, arranged in a hierarchical fashion and associated with organisational units, such as company, division, department, or project names (see the figure above). All objects and organisational units are defined by network administrators. Directories can be shallow (containing only a few levels) or deep and can reflect an organisation's reporting structure, geographical layout, information flow, or any combination of the above.

Four Steps to Net Nirvana

After developing and running its NetWare 4.0 prototype, LAN Systems has come up with a four-step process for designing enterprise installations based on Novell's operating system. The caveat here is that there is no single 'right' design; each network is different and has different considerations. Considering how important the design is to performance and functionality, it may be worthwhile to build several network variations, put them to the test, and select the one best suited to the task.

The four steps to LAN Systems' NetWare 4.0 design process are as follows:

- *Step 1:* Plan the directory tree. The tree is a map to all network resources. To create a directory tree, network planners have to become familiar with corporate hierarchies and departmental operations — a potentially daunting task for large organisations.

Continued on page 94

Building Up NetWare, Brick By Brick

It doesn't take much to patch a few bricks together — some water, some cement, and the job is almost done. But try building a whole house without proper plans and tools, and the results will be predictably crude, if not unusable.

So it is with networks based on Novell's NetWare network operating system. NetWare's automatic configuration and default settings can get just about any small workgroup LAN up and running smoothly. But when NetWare scales up to handle hundreds of network nodes connected locally or over the wide area by routers and bridges, those plug-and-play parameters simply do not hold up.

With the arrival of NetWare 4.0, more organisations are cranking up their NetWare installations to run on an enterprise scale. To deal with NetWare's growing pains, network managers need to learn how its various components work and how they behave and interact when NetWare expands beyond the workgroup.

This doesn't have to be as overwhelming as it sounds. Most performance problems related to NetWare scale-ups centre on the four principal communications protocols used by the operating system. These four protocols — IPX, NCP, RIP, and SAP — behave in predictable ways when they run on larger networks. In some cases, understanding how these protocols work can help network planners avoid common trouble spots. And for problem areas that can't be avoided, planners at least can be prepared to deal with the inevitable.

Each of NetWare's four main protocols carries out a specific networking task. The most critical of the four is IPX (Internet Packet Exchange), the network-layer protocol that guides every NetWare packet from its origination point to its destination. The other three main protocols reside atop IPX in the NetWare protocol stack.

NCP (NetWare Core Protocol) carries application messages between NetWare servers and their clients — which means it accounts for almost all traffic on the network. NCP handles everything from logging in, to reading or deleting files, to checking the status of a print queue. SAP (Service Advertising Protocol) is used by NetWare servers — including file, print, and archive servers — to broadcast their availability to other network nodes. RIP (Routing Information Protocol) enables NetWare routers — which may include servers acting as routers — to keep one another informed about network paths by exchanging routing tables.

When confined to workgroup LANs, NetWare's four main protocols handle their assigned tasks with no trouble. Bandwidth is plentiful (10Mbps on Ethernet and 4 or 16Mbps on Token Ring) — more than enough to handle the overhead protocol traffic generated by a couple of servers and a handful of clients. But when LAN segments are connected locally by bridges or routers, or by WAN links between sites, inefficiencies in the protocols can become very apparent.

Now that it is pitching NetWare as an operating system for the enterprise, Novell has begun to address some of the issues that affect NetWare's performance in larger networks. One of the more important developments is the expected arrival of the NetWare Link Services Protocol (NLSP), a more efficient protocol that will replace SAP and RIP (see table).

Some organisations may be able to afford to wait for Novell to release products that make NetWare more suitable for enterprise networks.

NetWare Routing Protocols

PERFORMANCE ISSUES	RIP/SAP	NLSP	COMMENTS
Protocol Type	Distance vector	Link state	Link state protocols are better suited to complex internetworks
Traffic Overhead	Can be high; under default setting, updates sent every 60 seconds	Low; updates sent only when changes occur	NLSP's lower overhead is particularly helpful for slower (9.6Kbps and less) WAN links
Handling of Failed Links	Convergence is slow; can take several minutes for new topology to settle	Convergence is fast — a new topology can stabilise in seconds	Fast convergence makes NLSP better suited to handling critical applications
Versatility	Low — no load balancing or splitting; also, suboptimal paths are common	High — offers load balancing and splitting and allows manual assignment of path costs	NLSP makes it easier for managers to direct traffic to preferred paths
Addressing	32-bit flat address space	32-bit hierarchical space	NLSP's hierarchical addressing lets managers create networks that are more highly structured, improving security and cutting overhead
Complexity	Low — simple to implement	Moderate — link state protocols are more difficult to implement for vendors and users	Added complexity means router vendors may have a harder time implementing NLSP
Compatibility	Works with any version of NetWare	Requires NetWare 3.11 or later	Server upgrades may be required, but users can run NLSP alongside SAP/RIP

RIP = Routing Information Protocol SAP = Service Advertising Protocol
NLSP = NetWare Link Services Protocol

IPX Issues

Because IPX is the underlying protocol for all traffic on a NetWare network, its behaviour is most important in determining whether a network maintains its efficiency as it expands. IPX-related problems typically occur when administrators join two or more NetWare segments together via a router. In a NetWare network, each segment must have a unique address; if an address has been used on two different segments, those segments can't be linked by a router until one of the identical addresses has been changed.

In theory, address duplication should not occur often — NetWare network addresses can be up to 32 bits long (usually appearing as eight hexadecimal numbers), which is ample room for the largest enterprise networks. In reality, network administrators have been guilty of using duplicate addresses in different workgroup LANs. When those workgroups operated as separate LAN islands, address duplication was no problem — in fact, it may have even helped many administrators responsible for several workgroup local area networks to use like numbers for like network components.

The effort needed to resolve the address duplication problem can be extensive: all file servers and routers must be reconfigured, which means shutting down the network and then sitting down at each machine to enter a new address.

IPX is actually easier to deal with than many other protocols, including TCP/IP, when it comes to the use of network addresses and the procedures needed to reconfigure addresses. Under IPX, address changes are made only on file servers and routers; workstations learn the network address on startup, by picking up RIP or SAP broadcasts and noting the network ID that other machines are using.

To help large organisations keep track of network addresses, Novell now offers a service called the Novell Network Registry. For a fee, the vendor will act as a central coordinator for assigning network addresses. The service is aimed at organisations that may want to extend NetWare links across company boundaries — any group that signs on for the Address Allocation service will get a unique block of addresses. Administrators still must remember to assign unique numbers from the block for each network they run.

Encapsulation Choices

Network addressing isn't the only choice made at installation that can come back to haunt network managers. As networks grow to include routers or translational bridges, the encapsulation method used on LAN segments can affect performance. When NetWare is installed, administrators have to choose a method for encapsulating IPX packets within media access control (MAC) packets for transmission over the LAN. With Ethernet and Token Ring topologies, network planners have a few encapsulation options: the IEEE and ISO define 802.2 encapsulation as a standard, but other approaches, such as SNAP (subnetwork access protocol), are widely used.

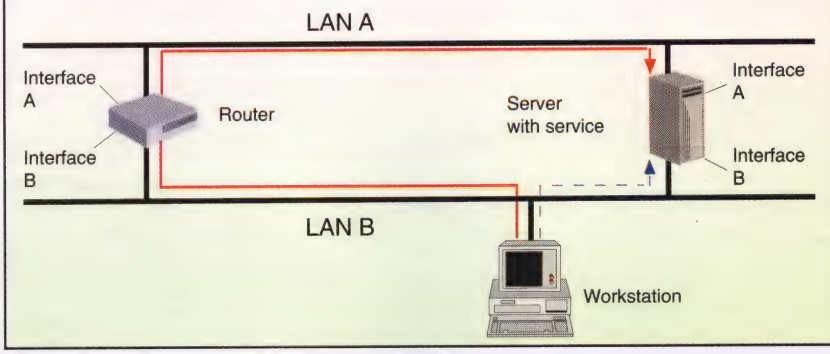
NetWare supports a number of these encapsulation alternatives. The problem is that some routers don't. Changing encapsulation methods to accommodate a router can be even more time-consuming than changing network addresses. Under NetWare 3.X and 4.X, the configuration file on every server and every workstation on the network must be changed. For earlier versions of NetWare, the effort is even more extensive: the NetWare kernel software must be patched on servers, and new software must be installed on workstations.

Other problems with encapsulation methods can occur when different network topologies are being connected, such as Ethernet and FDDI. For Ethernet LANs, Novell's default encapsulation method is a proprietary hybrid of Ethernet V2 and 802.3. Translating bridges, which are commonly used to link Ethernet and FDDI, typically have trouble passing these packets correctly. One way around this problem is to replace translating bridges with routers that de-encapsulate incoming packets and then re-encapsulate them to suit the network on the other side of the router.

Problems are also likely to crop up, at least over the near term, with the 802.2 encapsulation scheme that Novell has introduced with NetWare 4.0. In time, Novell's decision to forgo its proprietary encapsulation scheme for the 802.2 standard will make life easier for net managers. The short-term problem is that although most routers offer 802.2 support for one or more other protocols, hardly any do so for IPX.

The Long Way Home

If a router does not implement Novell's Split Horizon properly, traffic may take an unnecessarily long path to its intended destination. In this example, the router is capturing all requests from the workstation, which means requests intended for the server take an indirect path via LAN A.



Router Power

The speed with which routers handle IPX packets also affects NetWare performance as networks are scaled up. In general, many routers still don't do a great job of handling IPX traffic; most router vendors cut their technology teeth in TCP/IP environments and never really made the adjustments needed to handle IPX traffic efficiently. As a result, IPX routing performance for some routers is only one-fifth that of its IP routing performance.

One performance problem that plagues routers in particular is an inability to handle large packet sizes. Large packets generally are more efficient because they cut down on the number of packet headers and acknowledgments that need to be sent. This is particularly important in WAN environments, where bandwidth is relatively scarce. IPX can handle packet sizes up to 64 kilobytes.

For its routers, Novell offers a NetWare Loadable Module (NLM) called LIPX (for Large IPX) to handle larger packet sizes. LIPX comes with NetWare 4.0 and is available as an add-on for NetWare 3.X. Although many other router vendors have upgraded their IPX software to handle larger packets, some are still using IPX implementations based on the old XNS (Xerox Network Services) protocol, which limits frame sizes to 576 bytes. This restriction can severely impair performance for busy applications or for those running over complex internets.

NCP: One at a Time

As NetWare installations grow to the enterprise level, performance problems related to NCP are almost certain to occur. Novell created NCP as a LAN protocol; it functions as though bandwidth between servers and workstations were cheap and plentiful. That's fine when clients and servers are in close range, but put a wide area link between them and NCP becomes an agent of network congestion. NCP operates under a simple command/response framework: each workstation sends a single request to the file server and must wait for a reply from that server before issuing another request. Under NetWare, Ethernet packets generally are sent in 1K sizes. For every packet sent, the workstation must send a request and then wait for a response (the requested packet) before issuing a request for the next packet.

When clients and servers are directly connected via Ethernet, this approach makes sense. But throw in some internetworking gear and WAN links, and the resulting serialisation delay can become a real problem for interactive applications. The typical response time for a file server

Building Up NetWare, Brick By Brick (Cont.)

is about one millisecond; the extra millisecond it takes to clock a 1K packet into an intermediate Ethernet router before the router can forward the packet to the server plays hell with response times for interactive applications. In fact, placing a router between a workstation and server cuts throughput by 30 to 40% just because of serialisation delay.

One way around this problem is to use Novell's Burst Mode drivers for applications that generate large read/write requests, such as database packages. Burst Mode sends data from large read or write requests in streams of back-to-back packets, rather than waiting after each packet for an acknowledgment to fight its way back across the internet. Another, more expensive, solution is to switch traffic onto a fast medium like FDDI, where serialisation delays are negligible.

NCP traffic, which is characterised by bursts of intense activity, also can cause problems for other protocols carried over the enterprise net. NCP traffic bursts can clog router or bridge buffers and give erratic performance to users of other protocols, such as TCP/IP. Burst Mode worsens this by putting even more packets on the wire at once.

The solution to this dilemma is to use routers or bridges that allow traffic to be prioritised. With prioritisation, network managers can program routers and bridges to handle certain protocols (such as TCP/IP) first, leaving others (including IPX) to be processed afterward. This is critical when internetworks carry SNA terminal traffic, which is sensitive to delay.

SAP Servers

When it comes to NetWare overhead, Novell's SAP is a bit of an enigma. Its reputation for clogging internetworks with broadcast traffic probably is undeserved, yet left unchecked SAP can cause some WAN service charges to pile up.

SAP calls for routers and servers to broadcast at regular intervals the details of all the servers they know about. NetWare's default setting for SAP broadcasts is every 60 seconds. While this may seem like an obvious cause of poor performance, in practice SAP rarely is a problem — at least in terms of network congestion. Although slow WAN links (9.6Kbps or less) certainly can be adversely affected by SAP broadcasts, faster WAN links barely notice. Nevertheless, router vendors normally provide configuration parameters to adjust the way SAP is sent over individual links. For instance, many allow managers to change the default to send SAP broadcasts once every few minutes.

Even if WAN links faster than 9.6Kbps don't need this extra help handling SAP traffic, changing the broadcast intervals could be a big money-saver when traffic is carried by WAN services with per-byte charges. The trade-off to limiting the frequency of SAP broadcasts is that workstations may try to access network services based on out-of-date information.

RIP Problems

RIP lets IPX routers inform one another about the network topology. It also gives workstations a way to learn the best route to a server. Like IPX, RIP is based on technology developed by the Xerox Palo Alto Research Centre. Novell's RIP closely resembles the RIP commonly used in TCP/IP networks. The main difference is that the Novell version has an extra field to indicate the speed of a given link. IPX routers use this field to find the fastest links and then route packets accordingly, something that TCP/IP's RIP cannot do.

As a distance-vector protocol, RIP suffers from numerous problems that can reach disastrous proportions in large networks. RIP's biggest weakness is its inability to find an alternate route quickly if the link being used fails. If a link goes down, it can take minutes for the whole network to agree on a new topology. This is more than long enough for network sessions to time out.

Novell's RIP implementation can hurt network performance in other ways.

In NetWare topologies, file servers also contain complete RIP-based IPX router modules. The server-based routers usually aren't as powerful as external routers that may be present in large networks. The problem is that RIP doesn't necessarily take this into consideration when it plots network paths. If a network is not designed properly, traffic could be sent through the server-based routers rather than the external routers, reducing performance not only for traffic going through the server's router but also for the clients that directly access the server.

One way around this is to design the network so that the path to any given server-based router is always longer than the path to a faster external router. If this is the case, RIP will send traffic to the external router. Another solution is to use a recently released NetWare Loadable Module (NLM) from Novell that turns off the file server router completely. The drawback to this approach is that it eliminates the use of file servers as backup routers in case the primary routers fail.

Another RIP-related problem is caused by weaknesses in routers from vendors other than Novell. Novell's RIP relies on a technique called Split Horizon to prevent some inefficient routing possibilities from occurring. When it logs onto its NetWare segment, a workstation broadcasts a request inviting offers to route its packets to its network server.

If the workstation can access the server without going through a router, Split Horizon is supposed to make sure that any attached routers do not respond to the workstation's routing request (see the figure on page 91). But if routers do not implement Split Horizon correctly, they may respond to the request faster than the server; if this happens, packets from the workstation will be sent through the router even though a direct connection to the server is available. The end result is lower performance.

Better Days

Clearly, RIP is one of the weakest links in NetWare's enterprise-wide chain. Fortunately, a better long-term solution is coming from Novell. A new set of protocols, NLSP, will replace RIP and SAP (backward compatible, thankfully) with a link-state algorithm closely related to the open shortest path first (OSPF) and intermediate system-to-system (IS-IS) routing algorithm standards. NLSP's benefits will include much faster rerouting around failed links or nodes and the ability to adjust a server's routing parameters, making it route packets only if a main router fails.

Another recent change from Novell takes care of one final quirk related to routing under NetWare. The workstation shell that Novell has been selling for years attempts to find only one path to a server. It doesn't try to find an alternate route if that path goes down. Again, this arrangement is fine for workgroup LANs, in which secondary paths rarely are available. In enterprise nets with multiple paths, this approach is a decided liability.

Novell recently has released a better shell that tries to find an alternate path before presenting users with the hated 'Network Error: Abort or Retry?' message. If the network designer has provided a backup path, the shell will switch to it, and the user will notice only a slight pause in processing. Novell produced this shell for use with NetWare SFT III, and now sells it as its standard shell. Any plans to expand NetWare beyond the workgroup should include retrofitting workstations with the new shell.

Richard Thomas is an independent consultant specialising in LAN and internetwork design. He is based in Guildford, UK.

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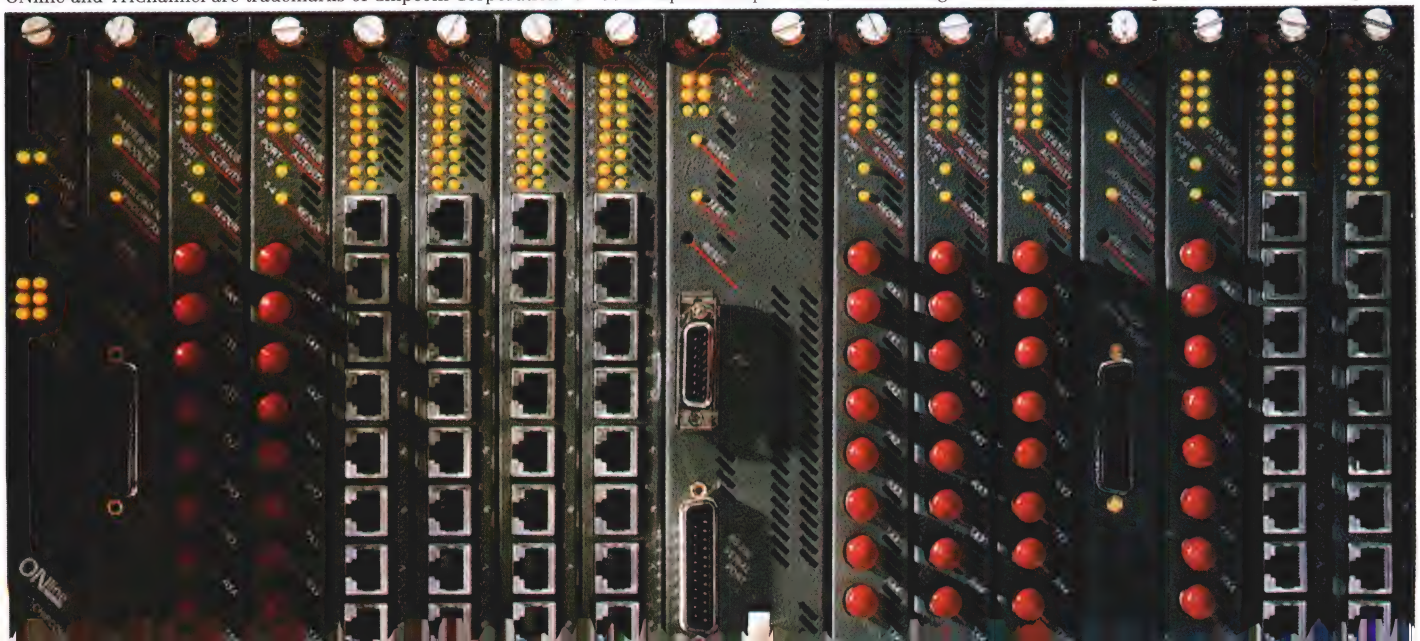

From page 89

- *Step 2:* Formulate a standardised naming convention. If objects and properties are named in a consistent manner, users will have an easier time browsing and searching for resources.
- *Step 3:* Decide how to partition the directory tree and where to store replicas. A partition is a logical subsection of the overall directory; replicas are copies of partitions stored on selected servers throughout the network. Replicas provide NDS with fault tolerance and speed end-user access to directory information by moving that information closer to users.
- *Step 4:* Devise an appropriate time synchronisation method for the network. Time synchronisation is necessary to ensure that updates to directory information are performed in the order they are made. Devising a time synchronisation configuration involves specifying what types of time servers (three different types are provided by NetWare 4.0) will be used for each server with a replica.

Several general schemes can be used to create a directory, and even combined to produce a simple, understandable view of the network to the user. A simple approach is to base the directory on the given company's organisational chart. The name of the company can be designated as the Organisation object, the highest tier in the directory structure. Departments or groups within the company can be designated as Organisational Units (OUs), which reside below the Organisation object. Alternatively, geographic locations can be designated as OUs.

If certain users or groups perform the same functions with the company, another option is to organise the directory tree by function. For example, if there are several development teams, and each development team works on a different project, each project team can be designated as an OU.

Decisions made during the directory tree planning stage will have long-lasting effects on directory usability and network performance. Design consistency is critical: if different departments create different directory trees, it will be impossible for users to access resources outside their immediate realm. For this reason, planners must follow through with directory trees that are well thought out and easy to understand.

NetWare 4.0 lets administrators create directory trees with an unlimited number of tiers. As the number of tiers increases, the hierarchical relationship of objects becomes clearer, but network names also become more complex. For networks that are being managed centrally, shallow directories make more sense because administrators don't have to sift through extra levels to get to a given resource. For networks with distributed management, deeper directories offer a more precise way to partition the network.

Beyond Theory

NetWare 4.0 documentation and Application Notes released by Novell provide some insight into the various ways to build directory trees. In the best of all possible worlds, network planners will be able to construct a complete directory tree that offers clear and consistent access to all resources. This world doesn't always exist. What happens if a given department simply refuses to abide by any naming convention and insists on keeping some of its resources out of the loop?

The simple answer is to use NetWare 4.0 security features to create private partitions limited to individual users or workgroups. Other work-around solutions exist, but they do affect the functionality of the overall directory. As mentioned, it is possible to let departmental supervisors create and manage their own parts of the tree at lower levels — at the expense of keeping those resources away from other users and thus subverting the intent of the enterprise network.

Another possibility — one that should be reserved for extreme cases — is to use multiple directory trees to accommodate reticent workgroups. Multiple trees may solve some political problems, but they create a host of other troubles. Each directory tree has its own database of objects not visible or accessible from any other tree. And right now, there is no easy way to merge directory trees.

Partitions and Replicas

From an enterprise networking viewpoint, the planning and setting up of directory partitions and replicas can be just as important as designing the overall directory tree. A well-designed tree gives users easy access to network resources; a well-placed replica keeps network overhead to minimal levels while ensuring a degree of fault tolerance.

For directory partitioning, the general idea is to keep logical segments of the directory as close to primary users as possible. Replicas are used partly to provide fault tolerance (a copy can help restore a primary partition if that partition is corrupted) and partly to move information out to more users. For instance, a branch office that frequently accesses resources at a regional office could have a replica of the regional office's directory to reduce traffic sent over the network for directory lookups.

The trick for network planners is to build in enough replicas to ensure fault tolerance and reduce directory traffic without crossing the line that makes replicas a drain on network bandwidth. If too many replicas are created, the amount of traffic required for updating could stress low-speed WAN links in an enterprise network.

To provide an acceptable level of fault tolerance, each primary directory partition should have at least two replicas (the location of these replicas is not important). If a partition is lost and no replicas are available, any users of resources associated with that partition will be locked out of the network until the partition is rebuilt by administrators. As a rule of thumb, Novell suggests limiting the number of replicas stored on any one server to 10 to 15. Too many replicas in one place can lead to performance problems on the server, because much of the server's time would be dedicated just to maintaining replicas.

A Matter of Timing

Time synchronisation of all severs is crucial to directory distribution under NetWare 4.0 Under NDS, a directory change can be made by any source that has a read-write replica of a partition. Updates to directory information are time-stamped the instant a change is made and then sent to all replicas of the partition in question. If two sources try to change the same object, the changes will be applied in the chronological order according to their time stamps.

This system of changes is predicated on the theory that all servers are synchronised. To ensure that this is the case, NetWare 4.0 includes Time Synchronisation Services (TSS). In essence, TSS creates a server hierarchy for clock synchronisation.

NDS time servers communicate with one another via Novell's Server Advertising Protocol (SAP). Since SAP messages, which are broadcast to all nodes at regular intervals, can consume inordinate amounts of bandwidth, network planners may opt for a custom configuration, in which a specific time source is designated for a particular server. With a custom configuration, SAP broadcasts are replaced by direct communications between time sources and servers.

The trade-off to a custom configuration is that it is more difficult to install or remove time source servers. With default settings, changes in the configuration of the network servers can be accomplished quickly; even time server modes can be changed without causing havoc on the network. Using a custom configuration, the approved server list maintained on each server must be changed manually each time a new time source server is added to the network.

As they deployed NetWare 4.0 in their prototype network, evaluators at LAN Systems discovered a number of changes to NetWare utilities that will require some retraining for operators. Among the more notable changes is NWADMIN, a Windows-based utility for managing the NetWare directory and all its objects. NWADMIN replaces SYSCON, a menu-based utility used to manage the NetWare bindery, the primary directory scheme of previous NetWare versions.

NWADMIN is much easier to use than SYSCON. It displays the directory of network objects in a graphical, hierarchical fashion. Network planners can build directory trees using the new utility. The only

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catch, as evaluators found, is that NWADMIN needs a bit of processing pop, especially if used at the same time that other applications, such as on-line documentation, are loaded. A 486 can help speed things along. For those who don't use Windows, Novell offers NETADMIN and PARTMGR, which essentially are DOS equivalents of NWADMIN.

Workstation Changes

NetWare 4.0 includes several important changes to workstation software. Perhaps the most radical change is that 4.0's workstation software does away with the familiar NETX shell, replacing it with Virtual Loadable Modules (VLMs). This architecture, among other things, allows for better memory management.

Among the changes most important to network administrators, Novell has made a clean break from its use of dedicated IPX drivers, casting its lot instead with its Open Data-link Interface standard. ODI software separates the protocol stack from the network interface card; a protocol stack that supports ODI, such as TCP/IP, can be used with any ODI-compliant network card. Novell had offered ODI in more recent releases of NetWare 3.x, but its use was optional.

One benefit of ODI is that upgrades are easier. If new versions of Novell's drivers are introduced, they need only be copied to the user's directory; net managers don't have to manually create a driver (by linking a number of different programs) for each adaptor in the network.

ODI's most significant benefit is that it enables workstations to handle multiple protocols simultaneously. Users can load and unload different protocols as needed. This is essential in enterprise networks, where different servers and hosts are accessible only using specific protocols.

The new workstation software, through ODI, also comes standard with support for communications enhancements that are essential to enterprise networks. These include Packet Burst, Novell's sliding window protocol that allows multiple packets to be sent before an acknowledgment is needed, thus improving performance over wide area links. Other enhancements include Large Internet Packet (LIP), which allows larger packets to be transferred across routed networks, and packet signature, a security feature that uses the public key encryption scheme from RSA Data Security to prevent packet tampering.

One thing that hasn't changed is that there still is no way to automate the task of upgrading large numbers of workstations. Novell does provide an upgrade utility, called WSUPGRD, for use with its installation program, but it is recommended only for networks with similarly configured workstations — which means it is inappropriate for enterprise networks.

The Ring Thing

Another NetWare change that managers need to be aware of is that with NetWare 4.0, Novell is letting administrators run applications in different protection modes. In another subtle change that could help enterprise networks, Novell has given in to advocates of memory protection and now specifies that NetWare applications, or NetWare Loadable Modules (NLMs), can run at ring 3 as well as ring 0.

Under NetWare 3.11, NLMs from Novell and third parties all ran at ring 0, an unprotected mode in which one application can overwrite data in memory from another application or the network operating system itself. Applications that operate at ring 0 are allowed to use memory on the server as they please; ring 3 applications must go through standard communications 'pipelines' or 'conduits' (in other words, through proper channels) before using resources.

Up to now, all NLMs have run at ring 0, which meant the possibility existed that they would overwrite data from each other or the host operating system. By letting administrators designate some NLMs as ring 3 applications, Novell is offering a measure of memory protection.

Novell suggested that new NLMs be run at ring 3, with the idea that they would be changed to ring 0 once they proved to be stable. For now, network managers will have to follow manufacturer recommendations for specific NLMs; some existing NLMs may not even be written in a way that allows them to run at ring 3.

It should not be taken for granted that all NLMs will work with NetWare 4.0. New versions of some Novell NLMs, including NetWare for Macintosh and NetWare for SAA, are planned.

Tape backup raises another NLM compatibility issue for early users of NetWare 4.0. In theory, tape backup software supporting the Novell Storage Management Services (SMS) set of application program interfaces is supposed to work with NetWare 4.0. The only problem is that Novell has made some changes to SMS to ensure compatibility with NDS. Third-party vendors of tape backup NLMs have said they will introduce updated versions of their product.

John Herron and Ben Ruiz are directors of the Research and Consultancy Group at New York-based networking systems integrator LAN Systems.

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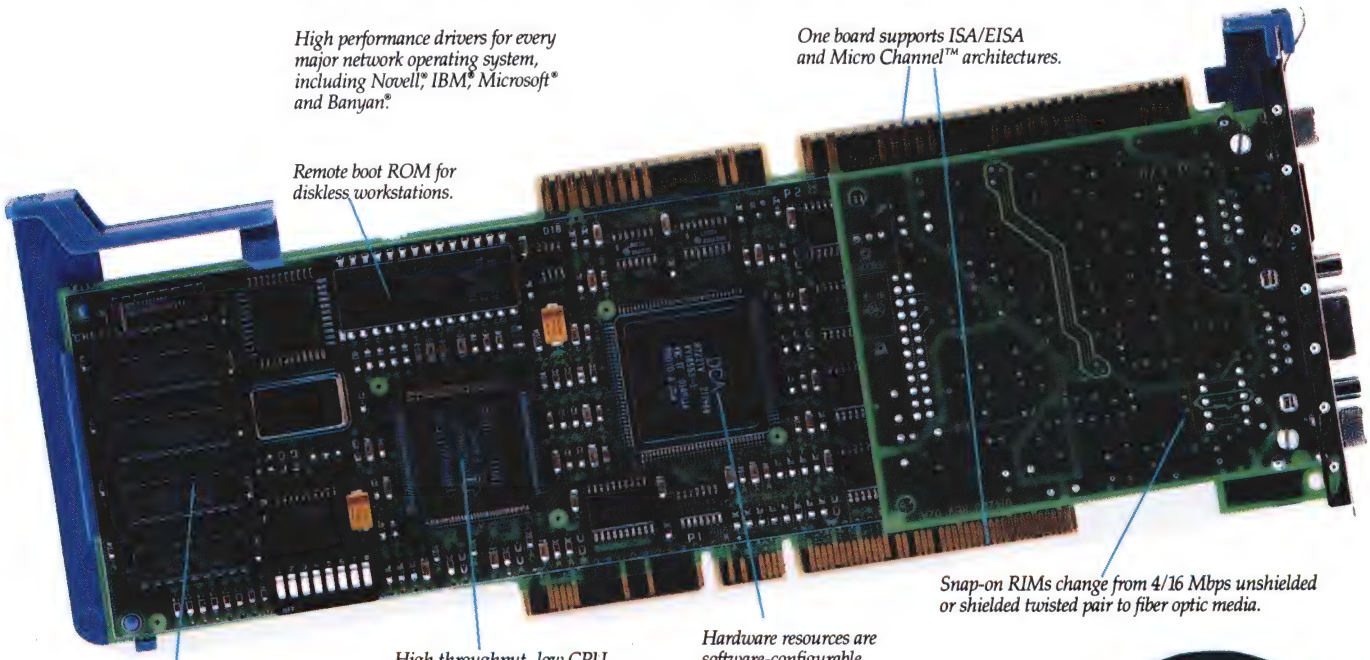

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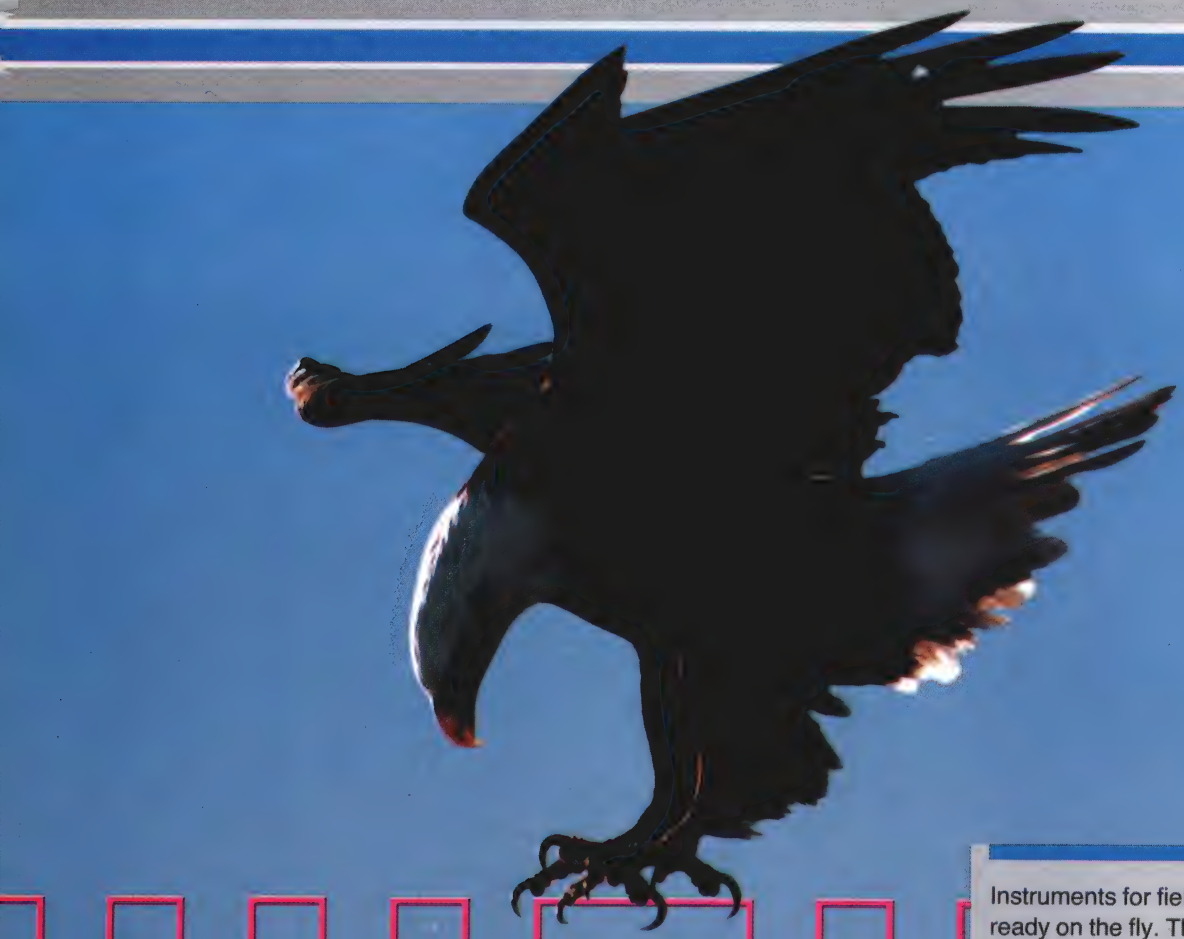

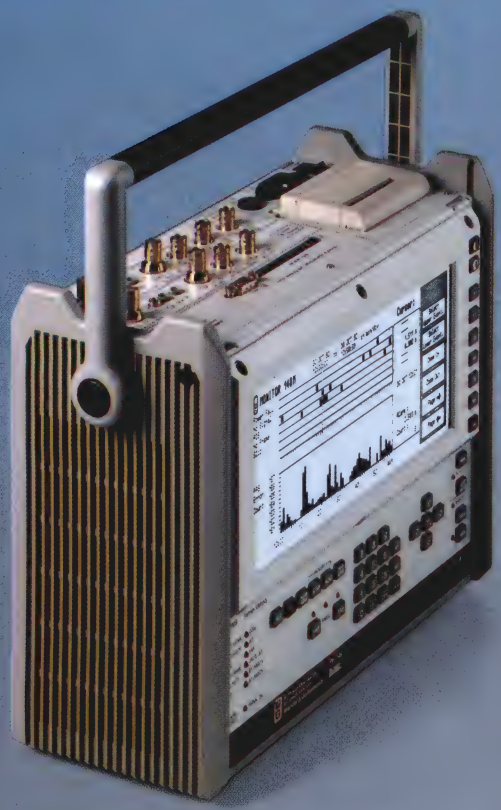

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Implementing Workgroup Networking

In this, the second part of our feature on workgroup networking, Graeme Le Roux examines its implications for network operating system, protocols and hardware platform selection.

The first part of this article (see 'Just What is Workgroup Networking?' in last month's issue) defined the foundation concepts relevant to workgroup networking and went on to discuss two of its four major elements — groupware and messaging — and examined the practical problems of their implementation in PC network environments, notably the problem of rendezvous. This second article will look at some of the implications of workgroup networking in the areas of NOSs, protocol choices, hardware platforms and system management — in short, layers 1 and 2 of the workgroup networking model, which were introduced in last month's article. This model is reproduced as Figure 1 on page 100. It should be stressed that this model is a tool for discussion, not the basis for any standard.

A workgroup network is characteristically an abstracted environment. This means that many of the traditional applications functions which are found in a typical network are either absent or structured very differently. As an example, consider the network shown in Figure 2 on page 101. This is a simple Ethernet network with a 10Base-5 (Thick Ethernet) backbone, to which a minicomputer host and a hub are directly connected. Workstations and a server are connected to the hub via 10Base-T. Unless the hub has some routing or bridging capability, all traffic will appear over the entire system.

Today the most common form of host access for users at workstations will be via some form of terminal emulation program which will permit a Telnet-type connection. Depending upon the application, and possibly the type of terminal being emulated, there may or may not be some character buffering done by the workstation.

Assuming a simple Telnet session with a basic VT100 emulation, every character typed by every user is wrapped in a TCP/IP frame and transmitted via the Ethernet to the host, which buffers it and then processes the input — typically by handing it to a client process which in turn generates a local transaction, which is handled by a server application of some kind. The network server which is attached to the hub does absolutely nothing during this process: the only processing done at the workstation is the relatively trivial amount associated with running the terminal emulation program, a network client and a protocol stack.

This is a relatively inefficient use of processing power and, since every workstation must have the capacity to access the host, it is a potential security nightmare. It is also a very inefficient system from the point of view of network traffic management. If the host is running a core business system it is most likely that a substantial percentage of network traffic will be directed at the host — so putting an expensive bridge or router into the hub or between the hub and the system backbone will have little effect. The scalability of the system is severely limited for the same reason. Worst of all, if the host is down or unreachable, users will have to resort to some other system — probably paper. If this is, for example, a telemarketing system or a trading application in a dealing room, recovery from such a situation will be a costly and potentially error-prone exercise.

Figure 1: The Workgroup Networking Layer Cake

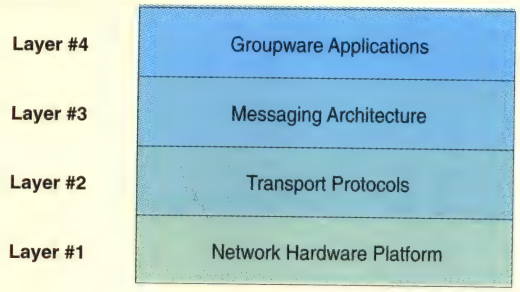


Figure 3 on page 101 is the same network designed around one possible workgroup model. The first and most obvious difference is that only the network server and the host are connected directly to the backbone. Workstations hold sessions with the network server, not the host. Less obvious is the fact that while the network server must be able to act as both client and server (in the processing sense) on all its Ethernet ports, it is not required to bridge or route between ports — workstations talk to the network server, not through it. This in turn permits the use of an efficient, non-routable protocol within the workgroup and the use of a routable protocol on the backbone, which will permit maximum management flexibility, particularly when wide area links must be connected to the backbone.

Quite incidentally, this configuration eliminates the one major edge most existing NOSs have over Microsoft's Windows NT — the ability to bridge or route between network ports. In fact, from a security point of view, such a capability is a positive disadvantage. But then, if your NOS has such a facility you don't necessarily have to install it. Assuming that the workgroup's server and hub are physically secure, this arrangement of discrete server network ports is about as secure as a network can get while still being usable. Workstations do not have either a physical connection to the host or the software required to access it if a connection were available.

Get Into Groupware

So how do users in, for example, a telemarketing operation, use the data stored on the host? The answer, as you might have guessed, is via a groupware application.

Figure 4 on page 102 shows how terminal emulation packages on individual workstations are replaced by reasonably simple 'front end' groupware application clients. These clients communicate with a groupware server application which is resident on the workgroup's network server — i.e. 'server' as in hardware platform. This application would make a subset of the host's data set available to its clients. Users operate on this data set rather than directly on the host's. On a pre-set schedule or in response to a given set of triggers the groupware server application would establish a connection with the host and both data sets would be updated.

As shown in Figure 4, this connection can be a 'real-time' one, via something such as RPC, or a 'just-in-time' one via a message handling system (MHS). By establishing a session via an MHS which has the capacity to store transactions, a certain amount of insulation from system faults is possible.

The catch is that users may require real-time access to certain data — stock levels, order status, etc. In this case a real-time mechanism would have to be used. In the event of, for example, a host shut-down, operations which used this real-time mechanism would be unavailable, however operations which used the MHS would be transparently queued by the system, and no paper-based backup would be required. When the host came back up, queued transactions could be automatically processed without the potential for errors that would arise from manual recovery.

The use of just-in-time connections across a network backbone has several benefits, particularly in a WAN environment where bandwidth is expensive. The primary advantage is that by adjusting the schedule by which links are made between servers one can flatten out the peaks in bandwidth usage across wide area links or shape the usage curve to make the most cost-effective use of the link — e.g. off-peak rates or fixed call duration.

Simplified Modelling

A system based on the scheduled transfer of information is also much easier to model than a totally asynchronous one, and therefore capacity planning is simplified. If a system can be implemented which relies entirely on just-in-time links then bandwidth-on-demand technologies like ISDN may be used more cost effectively than permanent point-to-point links.

Conversely, point-to-point links may be used exclusively for voice traffic during office hours and exclusively for data after hours, without the need to specially configure voice/data integration hardware (provided it allocates bandwidth dynamically). In a campus LAN or internet you may also be able to deploy a backbone transmission system based largely on switched Ethernet technology rather than more expensive bridges and routers. This will depend heavily on your backbone traffic load, and will be discussed in more detail a little later.

Another significant advantage is that a change in the protocol used in wide area and backbone links does not require any modifications to users' workstations which would simplify changing from, say TCP/IP to OSI protocols, not to mention greatly simplifying the day-to-day maintenance of a TCP/IP address space.

The converse is also true. If you decided to switch from, for example, NetBEUI to some other non-routable transport your core systems which run across the backbone (and therefore the interaction of the processes which comprise your core business systems) would remain undisturbed.

Design Considerations

The interaction and location of the component processes which make up the system illustrated by Figure 4 have some important implications for the network designer — the primary one being that the workgroup server must do significantly more data processing. In the example given above it will be running a reasonably sophisticated database engine. This means that it must either make heavy use of some mechanism like NetWare's NLMs or, preferably, be running a full blown operating system, for example VMS, some form of Unix, OS/2 or Windows NT.

This in turn means that at least some of your servers are not necessarily going to be Intel-based PCs. Whatever a server platform is it will require greater available processor bandwidth, memory and disk storage than the workgroup server in the Figure 2 scenario, just as the Windows for Workgroups workstations discussed in Part One of this article required a higher grade of hardware than their simple DOS counterparts — as the saying goes, there's no such thing as a free lunch.

It was also pointed out in last month's article that it is necessary to have a server per workgroup in order to avoid — though not solve — the problem of rendezvous. Since it is likely that you will have several workgroups, it is almost inevitable that you will have multiple servers and that these servers will require remote management capabilities. There are also practical reasons why these servers will require remote management. They will be deployed as close as possible to the workgroups they serve — ideally locked away in a rack-mount cabinet with the hubs by which individual workstations are connected.

Figure 2: A Simple Ethernet Network

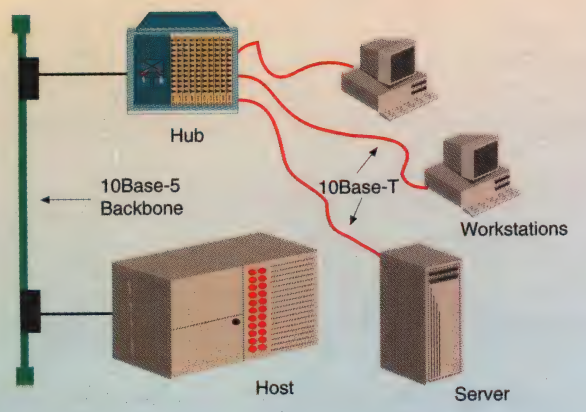
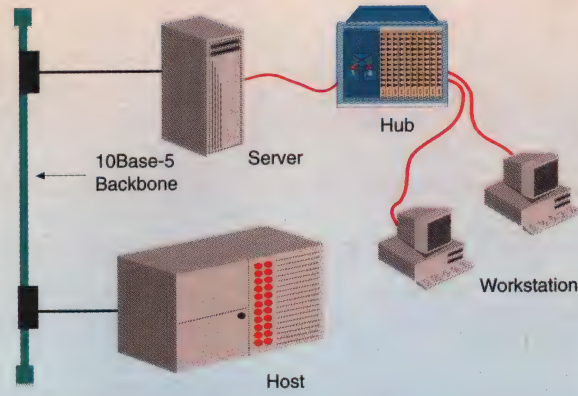


Figure 3: A Workgroup Model of an Ethernet Network



This means they will not have monitors, keyboards or mice. In fact, they will be little more than a motherboard equipped with a disk controller, network interfaces and sufficient memory for the tasks required. Not even serial or parallel ports are needed if printers which may be directly attached to the network, via the hub, are used.

Notice also that as the number of users increases, the backbone bandwidth required in Figure 2 approaches the sum of the network throughput of all workstations, workgroup servers and the host. In Figure 3 required backbone bandwidth is proportional to the sum of the network throughput of workgroup servers and the host only. The number of users is irrelevant to the equation, since the workgroup server's network interface to the backbone has a fixed maximum throughput.

As will be discussed later, this is particularly important when the system's backbone bandwidth requirements exceed that which is currently available. The throughput of a workgroup server's network interface to the system backbone will consist of real-time (say RPC) and just-in-time (via MHS) traffic, plus a certain amount of traffic generated by processes which relate to system housekeeping. If the software system is carefully designed it should be possible to tune this traffic so as to level the average usage curve of any one workgroup server's backbone interface.

This implies that system designers and programmers have to be made to understand the need to provide this capability. If servers can be tuned in this manner then the approximate number of servers which can be supported for a given amount of network backbone bandwidth can be found by simple division. Furthermore, the accuracy of this sort of approximation can be easily verified by monitoring gross traffic flow on the system backbone. The result is a simple and reasonably accurate formula for capacity planning for a company's core business system. This is possible because all of the asynchronous traffic which ordinarily complicates such planning is confined within workgroups.

System Interaction

The interaction between the groupware server application, based on the workgroup server, and the host-based host application client shown in Figure 4 also has some significant implications.

Recall that the groupware server in the example above is a database engine which contains a subset of the database stored on the host under the control of the host server application. The host application client(s) exist purely to queue requests received from one or more groupware server applications either directly, via RPC or the like, or indirectly via a MHS. During a transition period from the sort of system which would use the sort of platform shown in Figure 2, to that illustrated in Figure 4, there may also be a host application client which handles requests received via terminal connections (Telnet or otherwise).

Once a number of workgroup applications are deployed there is no requirement for the host application client process, since it is just as easy to design the host and server groupware applications to interoperate. Furthermore, given that the MHS is built into the operating system platform on which these applications are running, both may be abstracted from the mechanics of communication by the use of APIs, with the result that the host's role is reduced to that of synchronisation of multiple databases held by one or more groupware server applications and, of course, centralised housekeeping tasks such as back-up.

The result is a process hierarchy, as is shown in Figure 5. Note that if you consider the group of systems analysts/programmers who are likely to be maintaining the host DBMS as a workgroup then there is little reason, aside from the host's processor bandwidth and the size of the disk farm that it can handle, to maintain the host hardware platform as a unique entity.

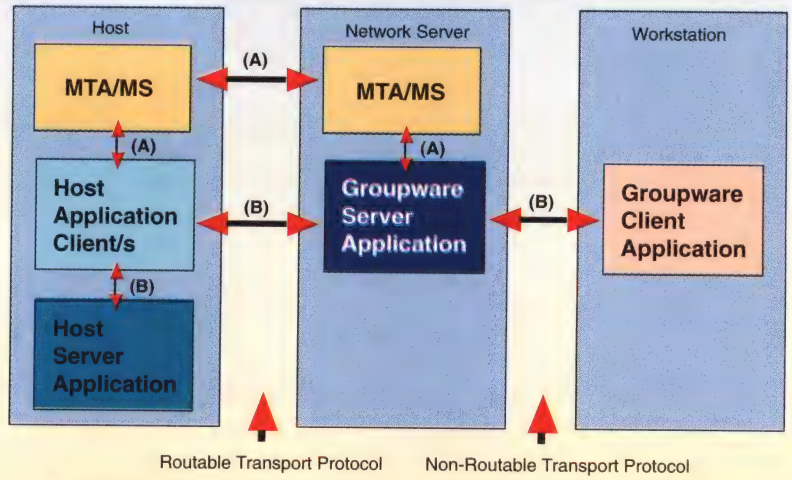
The processor bandwidth and disk storage available on most of the minicomputer platforms currently installed in this country can be easily matched by more cost-effective Pentium, 486, MIPS, Alpha or SPARC-based platforms which can be deployed with little or no special environmental considerations — as opposed to very expensive computer rooms — and which may be scaled to act as both workgroup and data centre servers.

Once these older systems have to be replaced or significantly upgraded it is likely that many EDP managers will be looking at solutions such as Windows NT on Alpha or MIPS-based systems, Solaris on SPARC architectures or Unixware on a multiprocessor box based on Intel CPUs. The limiting factors will be the availability of migration tools, skills, and of course the speed with which corporate inertia can be overcome.

This is not to suggest the total extinction of the data centre dinosaur — rather, that the basic nature of the beast will change. Data centre machines will become engines configured for a specific purpose or small number of purposes, which can share a specific configuration, rather than a general purpose machine whose configuration has been balanced to provide acceptable response for a number of disparate tasks.

These machines will run the same operating system as workgroup servers which will enable development work for both platforms to be done on cost effective workstations rather than on production EDP platforms. There will still be some behemoths in the basement. They will be required for specific tasks which cannot be adapted to distributed processing, but they will have well-defined, standard hardware and soft-

Figure 4: A Front-End Groupware Application Client



(A) Just-in-time store and forward link
(B) Real-time link

MTA/MS = Message Transfer Agent/Message Store

ware interfaces. Examples would be supercomputers running compute-intensive mathematical modelling.

Of course once we start to put databases etc. on various discrete hardware platforms and access them via workgroup servers, it is only a small step to having the databases on workgroup servers interact directly. If one considers electronic mail as a database system then you might say this is already happening, since many organisations have multiple mail servers in their networks. Once this inter-server traffic becomes a significant part of network load one has to think again about the design of a network backbone.

The situation has parallels with the workgroup scenario which was described in Part One. Changing the nature of users' workstations from simple NetWare clients to NetWare clients running Microsoft's Windows for Workgroups results in a change in the nature of the traffic flow. It is no longer purely between the NetWare server and users' workstations, but a peer-to-peer model between the workstations as well as between workstations and the NetWare server.

On the backbone, traffic is between workgroup servers and the servers and the host. As the number of backbone connections increases so does the required backbone bandwidth, no matter how carefully you design your groupware applications to conserve that bandwidth.

Segmentation Issues

At this point most network managers start thinking about either segmenting their system backbone with bridges or routers, or moving towards some high bandwidth technology such as FDDI. Reasonable? Yes and no. The purpose of a bridge or router is to confine traffic between stations on a single segment to that segment — in effect, to isolate sessions between a given group of stations (servers in this case) from the rest of the network.

This is a fine idea; however if the host remains as part of the system, as in Figure 3, then most traffic will go to the host segment, largely negating the beneficial effect of the bridges or routers. If the host is not present then you will have designed your system to level the load across your servers — after all, would you really spend money on multiple servers, then not use most of them? If the processing load is balanced across the system then the percentage of traffic which can be isolated on a single segment is roughly equal to the percentage of traffic per server times the number of servers on the segment. For example, consider a 10-server system broken into five segments of two servers each by bridges. Eighty percent of the traffic on the network will go across its bridges — and what you have in effect is five expensive repeaters.

So much for segmentation of an ordinary backbone, but what about higher bandwidth — say FDDI. Unfortunately FDDI is expensive and, assuming your network keeps growing, will only be a temporary fix. What will you do when you overload your FDDI backbone? Another problem with FDDI in this scenario is its limited flux budget. There will be a limit to the number of servers you can attach to any single ring, and multiple rings simply drive up the cost, since they require expensive bridges or routers. FDDI is better used to interconnect several discrete systems' backbones.

The key to resolving this apparently insoluble problem is to remember that any one server-to-server communication is limited by the bandwidth of each server's network interface. In other words, the problem is not traffic generated by each server-serv-

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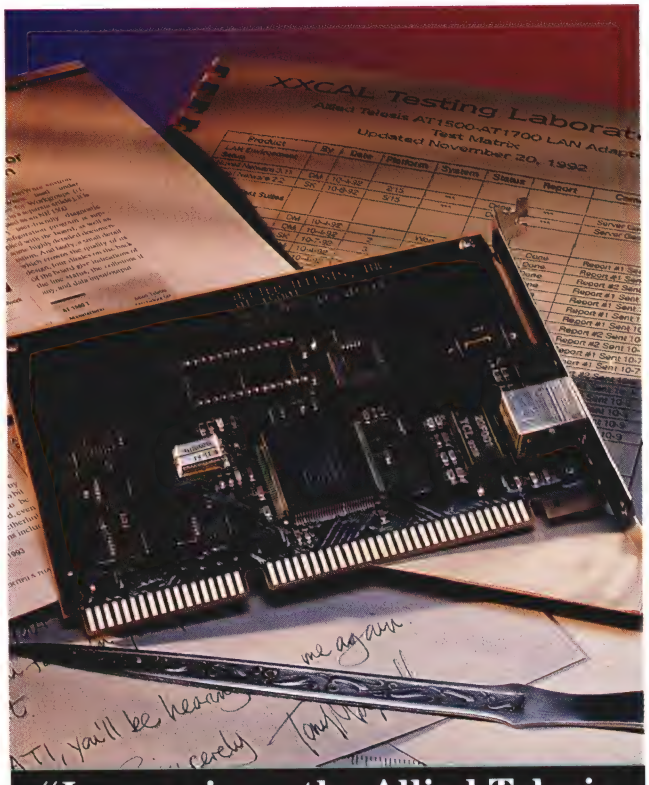

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er session, but rather the number of sessions. The solution is to provide multiple, parallel paths for these sessions. There are two ways to effect this change; install an Ethernet switch (assuming you are using Ethernet) or a backbone-in-a-box.

In the first case the Ethernet switch provides physically parallel paths, each of which is of full 10Mbps bandwidth. In the second, each backbone segment is bridged to a hub's backplane which has a bandwidth which is very much greater than of the sum of the bandwidths of all individual segments, resulting in effectively parallel connections.

Either option effectively reduces the number of servers on the backbone at any given instant. This permits the backbone to cope with a theoretical maximum number of servers, which is determined by the maximum number of servers which a single Ethernet segment can accommodate times the number of parallel paths available.

For example, assume that each of your servers requires 0.25Mbps average throughput on Ethernet. Ethernet has a 10Mbps bandwidth, but its performance degrades perceptibly once a sustained average bandwidth of somewhere around 25% is reached. This is about 2.5Mbps, or the traffic generated by about 10 servers. If you arrange your backbone as a 'star of buses' topography with, for example, a Kalpana EtherSwitch as its hub, then you can provide up to seven parallel paths or capacity for 70 servers. If each server has an average of just 30 users, this results in a network capable of supporting 2,100 users with no need for bridges, routers or any media more complex than simple Ethernet.

Such networks can also be combined in a hierarchy to form even larger systems, however issues of management and the problem of rendezvous need careful consideration in systems of such a size. It must also be stressed that the above calculations are based on the assumption that each server generates an equal amount of network traffic. If this is not the case, then traffic flow in the system can be chaotic in both the mathematical and the practical sense. Should chaotic behaviour appear, then routers must be deployed to segment the network system and permit load balancing. The onset of chaotic behaviour in a large network system is an administrative nightmare.

A system such as that described above requires quite sophisticated management. You have workstations, servers, workgroup hubs, Ethernet switches and possibly also bridges and routers, which may or may not have wide area links. You also have a number of groupware applications and an advanced MHS to worry about. Your primary management issue is the speed with which you can react to an abnormal traffic flow conditions — e.g. the onset of chaos. The reason for the abnormal traffic flow is of secondary importance.

Monitoring Traffic

Control of traffic flow in this sort of system requires the ability to dynamically tune groupware applications — particularly via the scheduling of MHS traffic — and to balance traffic loads across backbone links in response to key indicators of the onset of an abnormal conditions. These key indicators are generally specific traffic flow conditions at a few key points in your system.

You can see an example of this sort of problem in any large city's road system in peak hour. Using Sydney as a example, traffic controllers watching the harbour bridge make adjustments to traffic lights all over the north shore. If they do not, then traffic banks up on Victoria road. This is a simplistic example, but the mathematics behind the problem is anything but simplistic.

To return to the network scenario, you can obtain traffic flow from boxes around your system via SNMP and then adjust your software systems through another interface. In Sydney's road system, the administrators have one system by which they can both monitor and adjust traffic flow. Unfortunately the same is not currently true in a network. You could build SNMP monitoring capabilities into your groupware applications, but this would assume you were writing the applications from the ground up. In most cases you are going to be using off-the-shelf components and development tools which are not typically aware of a network at the same level SNMP is. In any case Heisenberg's uncertainty principle applies. SNMP would generate a significant amount of traffic, possibly enough to provoke the sort of situation you are trying to avoid.

In a nutshell, SNMP and most current network management systems are designed to enable administrators to manage layers one and two of our workgroup model, while what is required here is a mechanism by which a network system based on a workgroup networking model can, to some degree, manage itself. Ideally, it would be useful to be able to implement some form of 'fuzzy-logic' management system based on a common management interface spanning all elements of the workgroup network.

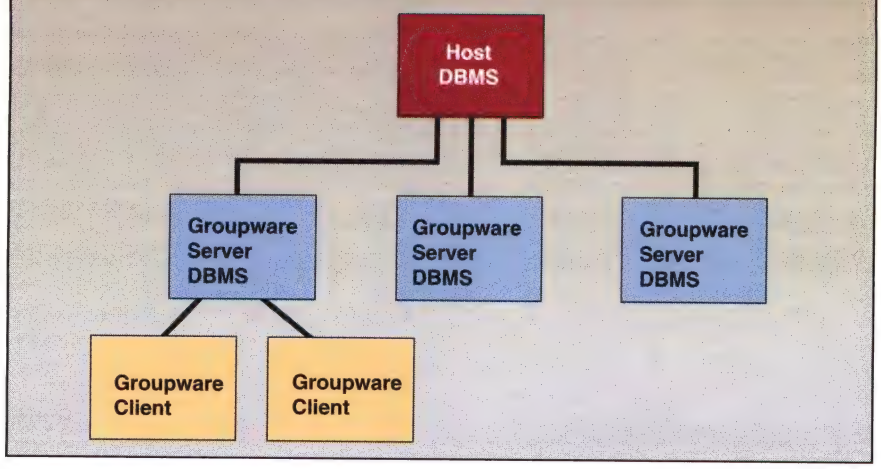
The OSI management protocol, CMIP (Common Management Interface Protocol), is intended to provide a common interface upon which such systems might be built without the sort of low-level blood-sweat-and-code-cutting which current management mechanisms would require. Until such protocols are widely implemented designers of large systems based on workgroup networking models will have to build systems which are inherently stable. That means combining bridges, routers, switches, hubs and different types of media with carefully designed hierarchical software systems running on operating systems which permit the abstraction of the mechanics of data transport in a heterogeneous environment.

Making the Change

Possibly the biggest headache of all will be the transition period during which existing systems are broken up, rebuilt or replaced. This is likely to take years. During this period administrators and users will have to get used to a very different type of interaction with computing systems, and as systems are changing no doubt companies' business needs will change.

The commercial world started adopting mainframe computers in the 1960s, minicomputers began to dominate in the late 1970s, PCs appeared in the early 1980s and PC networks a few years later, yet in spite of the changes brought about by these systems we are only now considering a commercial environment in which all platforms are equal and processing is done where and when it is needed.

Figure 5: A Process Hierarchy



Graeme Le Roux is a Director of Moresdawn Pty Ltd (Bundanoon, NSW) and specialises in local area network consulting services.

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It all starts with the **EtherHub-12i**, Accton's 12-port intelligent Ethernet wiring concentrator. This 10BASE-T hub is SNMP-ready so you can upgrade to network management at anytime.

Adding a single component, the **EtherHub-MGT**, brings SNMP to the *whole* network. And it's as simple as plugging in a cable. There are no cards to install.

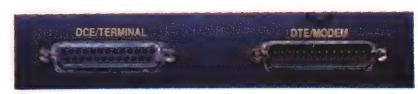
AccView, Accton's Windows-based management software, comes bundled with the EtherHub-MGT. AccView provides a user-friendly interface to monitor, control and manage up to 168 nodes with SNMP.

A single EtherHub-MGT can manage as many as 14 EtherHub-12i's through a simple external cable connection on the back panel.

Add other media to the stack by using the EtherHub-6Fi Fibre Hub or the EtherHub-8Ci 8 Port coax hub. Add Wide Area cabability by including Commpass Remote.

- Component-based design for plug-and- play upgradeability
- Add SNMP including AccView for as little as $6.00 per port
- Supports SNMP MIB I & II for interoperability
- Fault isolation by design

The EtherHub 1000 System is the SNMP solution that puts you in control of both your budget and your network. Accton's component-based architecture lets you buy 10BASE-T today and add SNMP tomorrow.



The EtherHub-MGT is equipped with two RS-232 ports for out-of-band management.

ACCTON Products are distributed in Australia by A.C.& E. Sales Pty. Ltd.

ACCTON is an ISO 9001 Certified Company

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SMC Ethernet Adaptor

Standard Microsystems Corporation has announced a new line of 16-bit Ethernet local area network adaptors which offer a comprehensive feature set, according to company officials.

The EtherCard Elite Ultra range provides: a 20% performance increase over all previous SMC adaptors; the EZStart installation utility for improved ease of use; Super Disk, which includes certified software drivers for most network operating systems including Windows NT; and Simultasking.

SMC's Simultasking technology employs SMC's fourth generation Ethernet controller to allow multiple data transfer processes to be performed simultaneously. It enables an Ethernet packet arriving at the adaptor to be forwarded immediately to the PC before it is fully received into the adaptor's buffer, reducing latency and improving overall network performance.

SMC Elite Ultra adaptors also come with the company's PC/Agent/SNMP, a utility allowing PCs equipped with SMC Elite Ultra adaptors to be managed by any SNMP manager.

SMC (02) 241 2933

Olicom Pocket Token Ring Adaptor

Olicom has announced a new Pocket Adaptor for the connection of notebook PCs to Token Ring networks. The company says it is the only pocket adaptor currently available which supports both STP and UTP cabling. It connects notebook PCs to any 16/4Mbps Token Ring network through the parallel printer port. The adaptor runs all three known printer port hardware protocols — uni-directional, bi-directional and enhanced printer port protocol.

Officials said the Pocket Adaptor is based on IEEE 802.5 and IEEE 802.2 standards, and supports all major network operating systems including Novell NetWare, Microsoft LAN Manager, IBM LANs and communications software, and the DOS, Windows and OS/2 operating systems. The adaptors come with a 3-year warranty.

Force Technology
(02) 971 1000

10Base-T Daisy Chains

NetComm has announced the Australian release of the new EtherWave product family of daisy-chainable 10Base-T Ethernet products from US company, Farallon Computing.

NetComm officials said the products are ideal for smaller companies which are building Ethernet networks for the first time, or want to make the migration from LocalTalk or Thinnet Ethernet to 10Base-T.

The EtherWave products offer a standards-based Ethernet solution, with two unique innovations, according to Netcomm officials. First, the daisy-chainable design of EtherWave technology enables users to run 10Base-T Ethernet over STP wiring without the need for a hub. Also, the products have an auto-crossover feature that simplifies installation and network moves and changes by automatically selecting the appropriate adaptor configuration for any 10Base-T connection.

The EtherWave range can also be used to build peer-to-peer networks, and works with software such as Farallon's Timbuktu, Novell's NetWare Lite, Windows for Workgroups and Artisoft's LANtastic.

EtherWave cards, transceivers and adaptors range in price from $349 to $1,099.

NetComm (02) 888 5533

SMC's Elite Ultra can handle multiple simultaneous data transfers

Hypercom Speeds SNA-LAN Internetworking

Since its founding in Sydney in 1978, Australian firm Hypercom has built a very successful business around the design and manufacture of terminal and networking products for the financial industries, and now sells into 29 countries through a network of 36 distributors. Despite a low profile at home, the firm has secured 75% of the Asian market since its entry in 1985, and in the US 42% of all credit card transactions now go through a Hypercom node.

To further expand on this success, the company has announced a new range of internetworking products, called the Integrated Enterprise Network (IEN). The new family comprises four products: the Hypercom 1000, 3000, 4000 and 6000 Multiprotocol Nodes. Officials said the products will provide a modular, cost-effective multipurpose network for enterprise SNA and LAN integration. They provide local, branch, regional and mainframe/FEP interfaces with multiple configuration options for port count, network types, WAN setup (leased lines, T1/E1, frame relay, ISDN), and circuit/packet switching data transport methods.

Compatible with other router vendors' equipment and able to support virtually all legacy and enterprise protocols, the IEN family integrates dissimilar network traffic over a single high-speed backbone. The products feature a flexible architecture which employs parallel processing to create independent protocol processors which integrate SNA with multiple LANs and provide a very high level of availability, officials said.

The Hypercom Enterprise Network products differ from other SNA-LAN internetworking products in that they do not try to mould SNA into a TCP/IP form and make SNA sessions go through TCP/IP sessions by using techniques such as 'tunnelling.' According to Hypercom officials, because of the vast dissimilarity between SNA networking and internetworking assumptions, SNA encapsulation often results in a serious degradation of services based on SNA. The IEN approach uses a connectionless transport mechanism that SNA, TCP/IP and other protocols can use to establish their own session and transmit data independently. Each protocol has its own dedicated processor, and these protocol processors feed one or more transport processors, which are dedicated to the task of transport and WAN interfacing.

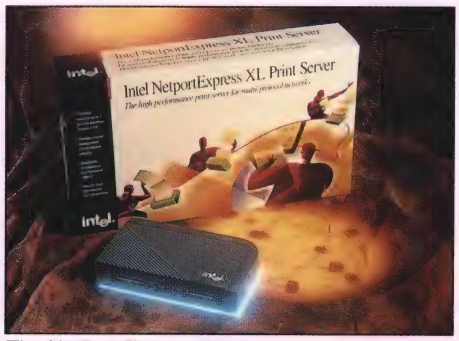
All IEN nodes incorporate both packet and time division multiplexing (circuit switch) capabilities, allowing users to allocate the required amount of determinism to applications. Nodes also integrate a wide range of WAN interfaces, including modems and digital service units (DSUs).

Hypercom Data Systems (02) 418 8011

Isopro Document Transport Client

Datacraft has released the Isocor X.400-based Isopro Document Transport Client for Windows. The product is an X.400 User Agent that enables access to Isoplex 800 message servers on all PCs, minicomputers and mainframes connected to public

Intel's LANDesk Manager offers managers a single point of control over network resources



The NetPort Express XL Print Server is designed for large, dynamic network printing environments

First Releases in Intel's New PC LAN Management Strategy

Intel has announced additions to its line of LAN management products as part of its Smart Network Services (SNS) strategy. The company has initially focused on three product areas — smart adaptors, smart application servers, and smart management software.

Intel's line of Ethernet adaptors has been extended with five new products which take advantage of flash memory technology to provide a high level of manageability and simple installation. The EtherExpress Flash32 LAN Adaptor is a high performance, auto-configurable 32-bit card with flash on-board memory. The card includes FlashStart to provide the same one-step configuration and installation to EISA workstations that is currently available on ISA systems. Also announced were two 16-bit cards which are fully flash-enabled — the EtherExpress Flash LAN Adaptor, and the EtherExpress Flash TP LAN Adaptor.

Intel has introduced the FlashWorks 1.5 software upgrade for its EtherExpress adaptors, which will add built-in virus protection, and a Flashworks upgrade kit for the EtherExpress 16C and EtherExpress 16TP LAN Adaptors which will offer full integration with Intel's LANDesk Manager, including the ability to view inventory information stored in flash and display history logs.

The company has announced enhanced versions of its StorageExpress backup servers which will integrate with Intel's LANDesk Manager to provide event-driven backup, which has the ability to launch backup jobs based on specific events or alerts on the network. The StorageExpress ELD 1.2, XLD 1.2 and XLE 1.2 backup servers offer new software enhancements including bindery emulation support for NetWare 4.0, support for multiple streamlined jobs, direct restore to workstations, improved File Tracker database and automated self-backup. Also included in the SNS strategy is a Token Ring version of its NetportExpress print server.

Intel's NET SatisFAXtion software version 2.5 now also offers integration with LANDesk Manager and incorporates LANDesk alerts, and includes driver support for Microsoft LAN Manager and IBM LAN Server. The new SatisFAXtion software also offers a special client billing module, which allows professional firms to capture fax data for billing back to their clients.

The company's range of network management software will be enhanced, with the announcement of version 1.5 of LANDesk Manager. The new version includes a Server Monitor that provides feedback on server status; a Network Printer Manager that simplifies printer selection and print job management; a Software Probe that can improve performance by offloading network traffic monitoring to a dedicated machine; and a Remote Access module for asynchronous communications.

Also announced is the LANDesk Response software, a Windows-based trouble ticketing application for automated problem management. The software features comprehensive problem logging and tracking, according to Intel officials. Trouble tickets contain all relevant information on problems including response history, and can be organised to display in a range of different ways, such as by customer, by problem, or by product, to suit specific work environments. The product also features powerful filtering, search and query capabilities, customised reports and charts and automatic notification of problem status changes.

Intel (02) 975 3300

or private networks or local area networks.

File transfer, multimedia document handling, faxing, e-mail and other functions are available using Isopro, without the need to switch applications to gain access to different functions. Isopro works with Isoplex message servers to link messaging systems throughout an enterprise and wide area network connection, or public or private X.400 services.

Via global interconnection of public e-mail services using X.400, Isopro is able to maintain contact with mailboxes and fax users all around the world, said Datacraft officials. They added that the native design of Isopro delivers the full X.400 feature set to the desktop without the need for gateways or protocol converters.

Isopro is based around Microsoft's MAPI interface, and supports DDE for ease of access from Windows applications.

An optional Isopro/Remote module utilises the CCITT P7 remote access protocol via dial-up asynchronous modems to link with the Isoplex 800 Message Store. Connectivity options include PAD/X.25 for use over public data networks and TCP/IP on LANs and WANs.

Datacraft (03) 727 9111

Spread Spectrum Modems

Pinnacle Communications has introduced the Cylink range of high speed spread spectrum radio modems.

The modems, known as Airlinks, support asynchronous operation at 19.2Kbps and 128-Kbps, and synchronous operation at 64Kbps and 128Kbps. The frequency allocation is in the ISM band between 915-928MHz.

The Spectrum Management Authority has registered the new modems for use in the ISM frequency allocation with the use of directional Yagi antennas, which enable the Airlinks to transmit up to 45 kilometres, subject to path availability.

Pinnacle officials said that by using the Airlink technology it is possible to interconnect local area networks and provide point-to-point links with voice, data and LAN traffic integrated over the same wireless link, something that was previously only possible using microwave or ISDN technology.

A pair of Airlink 128 modems cost $14,000 excluding tax. Airlinks will be available for the S-Band early next year, and will support transmission rates from 64Kbps to 512Kbps.

Pinnacle Communications (03) 532 5266

MVS/SNA and TCP/IP Printer Sharing

First State Computing has released Openprint, which the company says is the first standalone product to allow printer sharing between MVS and Unix hosts and across Novell LANs.

Openprint allows mainframe applications to take advantage

of high quality printers attached to Unix or Novell TCP/IP-compliant networks, while at the same time allowing networked PCs and Unix systems to take advantage of the high volume printing capabilities of mainframe printers, said officials. Organisations with branch offices can also direct reports to networked printers at the branches, saving on distribution costs.

Openprint runs under MVS/XA and MVS/ESA and is designed to use an assembler level 'socket-like' TCP/IP interface. The product is designed so that TCP/IP services are concentrated into a single module for portability, interfacing to IBM MVS TCP/IP V2.2 or greater with the LUCV interface.

First State Computing
(02) 247 1188

Unix Connectivity Solution

Stallion Technologies has introduced a new, expandable connectivity product line for Unix systems. Called EasyConnection, the system provides asynchronous serial connectivity for up to 256 users in expandable, clip-together modules of eight or 16 ports. Up to four 8-port or two 16-port modules can be connected to a host adaptor card via a high-speed link of 5Mbps.

Within each module, RISC processors are used to handle character processing and provide data throughput of 145Kbps per serial port. The product uses surface mount technology and a high level of chip integration, and hardware diagnostics and surge protection are provided on each serial port. The system can be upgraded by adding another module, said officials.

EasyConnection is available for SCO Unix and Unix SV Release 4.2, including Unixware. Eight-port modules are available with RJ-45 and DB25 interfaces, and 16-port modules are supplied with RJ-45 interfaces.

Stallion Technologies
(07) 870 4999

RangeLAN2

Smart Radio Modems has announced the introduction of the RangeLAN2 radio modem from Proxim. The RangeLAN2 unit operates in the 2.4 to 2.483GHz frequency band, with a range of up to 300 metres and a data rate of 1.6Mbps. It has 10 independent channels, and makes use of frequency-hopping spread spectrum technology.

Officials from the company said the RangeLAN2 architecture offers several advantages, including greater power efficiency and better security, the longest range radio design now on the market, the lowest power consumption of any similar wireless LAN product, the flexibility to support all local area network topologies, and the highest raw data rate of any wireless LAN product.

RangeLAN2 adaptors are priced between $595-$695.

Smart Radio Modems
(064) 523 112

EasyConnection modules provide up to 145Kbps throughput

New Stackable Hubs

Chipcom has announced a new family of stackable hubs. The ONsemble Stackable 10Base-T hubs are low-cost manageable solutions for users wanting to integrate remote sites into enterprise networks, said officials.

The range will deliver from 12 to 60 manageable 10Base-T

ONsemble stackable hubs can be managed using any SNMP system

ports connected via standard UTP and STP wiring.

The first two products to be released are a 12-Port Base Hub with full SNMP management, and a stackable 12-Port Expansion Hub which is managed through the Base hub. Up to four Expansion Hubs can be stacked on the Base Hub to achieve a total of 60 manageable 10Base-T ports, and the Expansion Hubs can also be used on their own as lower cost unmanaged hubs.

The new stackable 10Base-T hubs can be managed remotely over a wide-area connection using any SNMP management system. The ONdemand NCS runs under a wide range of leading management platforms including HP OpenView, Sun's SunNet Manager, DEC's Polycentre and IBM's NetView 6000.

The ONsemble Hub can also be managed through a terminal or modem connected to its RS-232 serial port. Officials said this enables network managers to troubleshoot problems, even in the event of network failure, and offers a lower cost management alternative for users not requiring the complete network management capabilities of an SNMP station.

The stackable hubs can also be remotely upgraded using in-band download to on-board flash PROMs — eliminating the need for on-site technical expertise at remote locations.

The ONsemble Base Hub has AUI and BNC ports for connecting to Thin or Thick Ethernet networks, and the Expansion Hub provides an AUI uplink port. The hubs can also be uplinked to ONline Concentrators and other equipment via a UTP connection in one of the RJ-45 ports. The hubs offer 10Mbps performance, and are fully compliant with IEEE 802.3.

Chipcom (02) 416 0653

Rumba for NetWare Version 3.2

Rosser Communications has released the new version of Rumba for NetWare from Wall Data Communications. The software now includes AS/400 connectivity in addition to IBM 3270 connectivity.

Officials from the company said the software is the only Windows workstation connectivity solution for both IBM mainframe and AS/400 systems that can operate simultaneously in the NetWare for SAA, NetWare for SNA Gateway and TCP/IP environments. The product offers support for the AS/400 word processing feature Text Assist, and features Hot Menus, QuickStep pads and other features to improve productivity, they said.

Access to the AS/400 is provided via NetWare for SAA, while Telnet 5250 support is provided for TCP/IP environments. Access to the mainframe is through NetWare for SAA or

the NetWare for SNA Gateway. TN3270 is also provided for TCP/IP environments, and to facilitate TCP/IP connection, version 3.2 includes Novell's LAN WorkPlace for DOS TCP/IP protocol stack.

Rumba for NetWare 3.2 can be licensed for 10, 25 or 64 workstations per LAN. Licence fees begin at $6,300 for a 10-user licence, and existing users can upgrade for a reduced price.
Rosser Communications
(02) 418 2544

NETBuilder Extended

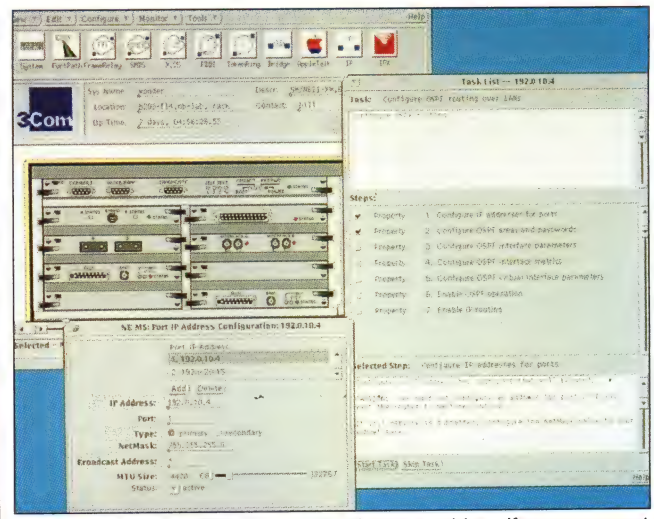
3Com has announced expanded network management for its NETBuilder family of bridge/routers, which is designed to work in conjunction with the company's new and recently debuted Transcend network management architecture.

New software tools within the Transcend architecture will now provide centralised software configuration, update and testing of NETBuilder bridge/routers. Newly added RMON-based SmartAgent features add high levels of self-managing intelligence to the bridge/routers, according to a 3Com spokesperson. The agents can intelligently monitor and control the bridge/router within user-specified parameters, and report events to network managers on an exception-only basis.
3Com (02) 959 3020

RMON Management

ADE Network Technology has announced the new NAT LANB/450 Remote Ethermeter network traffic monitor, which the company says is the fastest and most powerful in the Ethermeter range.

The new LANB/450 Remote Ethermeter is a high-performance Ethernet segment monitor which is powered by a 33MHz 80486 processor and configured with up to 4MB of RAM and 512K of flash memory, enabling



New software for NETBuilder bridge/routers adds self-management

software enhancements to be downloaded over the network.

New software features include duplicate IP address notification, multiple host and matrix table configuration and new node detection. Officials said the new node detection feature is an important security feature, providing the ability for the Ethermeter to send a SNMP trap message should it detect the presence of a new device.

The software can also inform network managers of a device changing its IP address or attempting to use an existing IP address.

The LANB/450 Remote Ethermeter also enables network managers to specify to size (up to 64K) of the host and matrix

Fibrescan's 1000 OTDR offers a range of different modules

tables to monitor large LAN segments, and in addition, managers can create multiple host and matrix tables and then filter those tables by protocol.

The new LANB/450 Remote EtherMeter is priced at $5,346 with 2MB of RAM, or $5,980 with 4MB or RAM.

ADE Network Technology
(03) 543 2677

Portable OTDR

Vicom Australia has introduced the Fiberscan 1000 Optical Time Domain Reflectometer (OTDR) to test the integrity of fibre optic cabling.

The unit provides all standard OTDR functions and incorporates a stable source and power metre in a rugged, weather-resistant modular design, according to officials from the company. It comes with an internal battery and charger, and is designed to be easy to use, enabling technicians to operate it without needing a user's manual. The Fiberscan 1000 is able to accept different modules to suit users' requirements, and operators can set event thresholds, with the ability to store up to 10 unique set-ups. The unit also offers one-button fault finding and real time trace analysis.

Vicom Australia
(03) 690 9399

Australian UTP Hub

Speedycom has released a new Australian designed and manufactured 8-port UTP hub called the Speedy 8. Officials said the unit is compact, comes with one AUI port and eight UTP ports, offers full IEEE 802.3 compliance, and is sold with a two-year warranty.

The Speedy-8 functions as the central hub, allowing support for up to eight connected users, and amplifying and retiming signals and retransmitting these to the attached host devices and repeaters.

Because the Speedy-8's UTP ports can provide internal cross-over, it is only required that users have a straight-through twisted pair cable to network PCs, and the star configuration allows devices to be connected and disconnected without disruption to the network, said company officials.

The Speedy-8 can be connected to Ethernet or Fibre Optic networks using Speedycom miniature transceivers connected to the hub's AUI port. Additional Speedy-8s can be

The Australian-made Speedy-8 supports up to eight users

added via any UTP port or the AUI port, expanding the number of nodes on a given LAN to 240.

The Speedy-8 comes with a 12VAC power adaptor, and is priced at $490.

Speedycom (09) 388 1755

New W&G Product Family

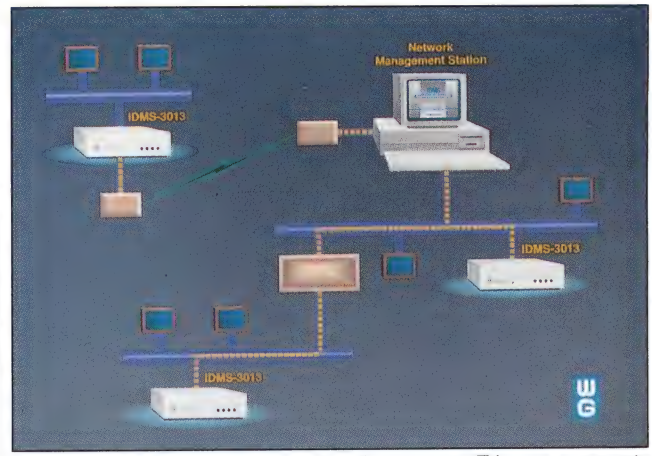
Wandel & Goltermann has announced the first product in its new Internetwork Diagnostics and Monitoring System (IDMS) product family. The SNMP-based IDMS-3013 Remote Segment Monitor uses the RMON MIB and collects data on remote Ethernet segments at wire rates and reports it to a central management station, allowing network managers to determine traffic patterns and utilisation levels to assist with capacity planning and network optimisation, according to W&G officials.

The W&G IDMC-3013 implements all nine standard functional groups of the RMON MIB to collect information about an Ethernet segment. Each group represents a unique piece of information which is collected by the IDMS-3013, and then periodically retrieved from workstations running IDMS Manager software.

The IDMS Manager can run as a standalone management station, or in conjunction with SunConnect's SunNet Manager, with other management platforms to be supported in the future, Wandel & Goltermann officials said.

Information provided by the new IDMS-3013 includes packet counts, collision, error and broadcast rates and Top-10 talkers and error producers. User-defined data captures in the software provide historical information for trend analysis and network planning, and alarms can be triggered on specific user-defined network events. The product's graphical user interface displays all monitoring results as tables, graphs or dials.

Officials said that the IDMS-3013 minimises the amount of network management traffic added to network loads by acting as a proxy for the central management system. Multiple management stations can simultaneously access information from the same remote monitor, and out-of-band management is supported for continuous, uninterrupted management when a segment fails.



The IDMS-3013 gathers network data from remote Ethernet segments

Wandel & Goltermann
(03) 690 6700

MultiPeer Version 2

Alloy Computer Products has announced the release of Version 2 of the MultiPeer Peer-to-Peer LAN operating system.

The new version offers improved functionality and performance, according to officials from the company. New features include the ability for different workstations on the same

MultiPeer 2 offers hot-key access to a range of optimisation procedures

network to use either or both Windows or DOS interfaces; access to all standard Windows features, a simple-to-use menu-driven DOS interface; and support for the IPX/SPX protocol and for almost any cabling topology, said the officials. Any workstation can be configured as a peer, a server or a client.

MultiPeer 2 offers automated installation, and a set-up option allows a wide range of optimisation procedures to be accessed via a hotkey. All modules can be loaded into upper memory, and officials said the system provides high performance because of its use of dynamic data compression, burst mode and variable packet sizing. It supports the Novell protocol suite, enabling direct connectivity to NetWare servers, and offers security options from network to file level.

Version 2 is supplied with E-note, a store and forward e-mail facility, and the system installs a fault tolerant Print Spooler in each workstation. Print jobs are restarted if a device goes off-line, redirection to four parallel and four serial devices is available simultaneously, and PostScript files are supported.

MultiPeer Version 2 can be purchased as either software-only licences or in workstation packs which provide MultiPeer licences, Alloy NICs, cable, T-devices and terminators. Entry-level workstation packs for two workstations sell for $598.

Alloy Computer Products
(03) 561 4988

Enhancements for Microfax

Microfax has announced a range of enhancements to its Microfax intelligent fax and data modem. New features include support for IBM Lexmark 4029 laser printers, a clip-on battery pack, the ability to upload stored faxes to computer, on-board diagnostics and self-test capabilities, improved error correction, and serial cable and AC adaptor included for no extra cost.

Officials said the clip-on battery pack gives the product greater flexibility when travelling, providing up to 80 hours of standby fax receipt and transmission from four AA dry cell batteries.

Microfax can output faxes to a printer without the need for a PC, transmit faxes from a PC without a modem, retrieve stored faxes from a remote location, and redirect incoming faxes to another location. If the printer is switched off, Microfax stores the message for printing later. Advanced software inside the unit controls its operations and has been designed to improve efficiency, said the officials. The unit comes with two data ports, one telephone line interface and an internal power supply, and sells for $495.

Microfax (02) 965 7230

The Three Telecommunications Revolutions

On 16-20 January 1994, about 1,100 telecoms professionals from around the world will gather in Honolulu for the 16th Annual Pacific Telecommunications Conference. Fittingly, and in celebration of the tenth anniversary of the Report of the Independent World Wide Commission on Telecommunications Development (The Maitland Commission), this year's conference theme is 'Forging New Links — Focus on Developing Economies.'

Our promotional literature for PTC'94 notes that the Conference will 'discuss how the issues of technology transfer, education, commerce, well-being, entertainment, information services, human resource development, restructuring and telecoms trade has fared during this time period. It will assess the impact of new technology on the future.'

The pace of technological change and the sheer volume of activity to which most of us in the field are now subjected may serve to blind us to the historical significance and drama of what is actually happening. For these changes are nothing less than a revolution. In fact, they constitute three separate but interrelated revolutions. The first revolution is that of the structural environment in which telecoms take place. The other two are technological: the wireless revolution (so lauded in *The Economist's* recent annual survey of telecommunications), and the 'wired' revolution of fibre optic technology (the backbone of 'electronic highways').

The environmental revolution began with the regulatory changes of the 1980s and the US divestiture of the former AT&T monopoly. That story and the subsequent liberalisation push in many countries, perhaps best articulated by the former head of Britain's Oftel, Sir Bryan Carsberg, has led to a new structural norm in which the old-fashioned PTTs are now the minority. Even the most traditional of PTT structures at least pay lip service to the goals of corporatisation, liberalisation and privatisation. Foreign investment is no longer seen as a security threat or infringement on sovereignty, but is seen instead as a necessary tool to finance national telecoms development.

Of course, the pace of change differs from place to place, region to region, country to country. We have looked at several specific examples in this column *passim*, from Korea to New Zealand to Taiwan to the Pacific Islands. At one extreme is the almost wholly-liberalised New Zealand case, and at the other extreme are the cautiously-opening monopolies in Taiwan, Vietnam, Fiji and a number of other countries. The pressure for liberalisation is one that is difficult to resist, however, as it is undoubtedly demand-driven. Look at Korea — only one competitor was allowed to compete for international telephone service, and then only permitted to serve a handful of countries offering only a 5% tariff discount. Nevertheless, within a few months this competitor garnered over 30% of overseas telecoms traffic.

If the regulatory revolution may be credited for having set the framework for change, the regulators themselves have nevertheless remained a few steps behind the frenetic pace of technological progress. In the realm of wireless telecoms, the rapidity of change certainly justifies the label 'revolutionary.' From the mid-1980s image of cellular phones as yuppie toys or a part of the BMW accessory catalogue, we have progressed to the point where wireless telephony is merely a necessary and integral adjunct to basic service. Within a few short years we will be at the stage of wireless multimedia services (many of which exist today) and the seamless 'mobilisation' of telecommunications. For the developing world, it is the advent of international low-earth-orbit (LEO) satellite services that will enable countries to leap-frog several generations of technological development and become part of the global network.

Therefore, wireless will become vital at the micro-level (residential service, mobile business service, not to forget satellite-delivered digital broadcasting) and at the macro global level (regional and international business linkage through VSATs, thin-route telephony via LEOs etc.). The hindrances to these developments are becoming less and less relevant. For many years it was argued that wireless development would be limited by spectrum concerns, particularly given the huge swathes of spectrum occupied by existing (not terribly efficient) services. That debate has been circumvented by the advent of new spectrum compression technologies which render each frequency far more efficient than heretofore, with multi-channel capabilities unimagined a few years ago.

Does this mean that the wireless revolution will leave the wired world behind? Only if you imagine a world of twisted copper pairs. The fibre optic revolution has easily matched wireless technology in progress, and harbours an almost limitless potential to provide new services. Fibre is seen as the backbone of the new goal of the 'electronic highway,' as expressed by US Vice President, Al Gore, and now current parlance in most advanced countries. Most advanced countries already have advanced datacomms and ISDN services and rely upon fibre networks for national and trans-border services. And most future multimedia development will rely on the capacity of fibre for delivery. Whether fibre-to-the-home becomes economically feasible or not, it will define the development of the network.

"For the developing world, it is the advent of international low-earth-orbit satellite services that will enable countries to leap-frog several generations of technological development and become part of the global network."

Largely, these three revolutions — regulatory, wireless telecoms, wired telecoms — are complementary. A liberalised regulatory environment allows a multiplicity of competitors to offer wireless services that by and large complement the basic wired network, which itself can do more and more as the definition of 'basic' expands. For developing countries, wireless telecoms can provide the technology to leap-frog and circumvent the pains of infrastructural wired network development, providing a high level of service in the interim. Wireless technology also enables 'thin route' rural and remote locations to enjoy high levels of service and access to the rest of the world.

The goal of PTC'94 will be to reconcile these telecoms revolutions to the special needs of requirements of developing countries. What works for Australia will not necessarily be the solution for Sri Lanka or Cambodia. But there are nonetheless far greater grounds for optimism than there were ten years ago, for the new telecoms revolutions will bring the developing countries forward in the telecoms domain far more quickly than could have been imagined a decade ago.

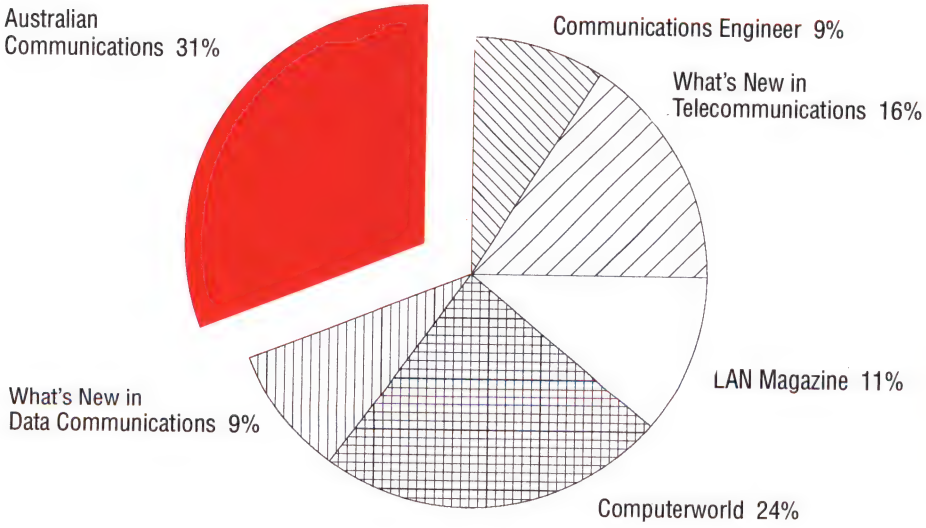
James Savage is the Assistant Director, Pacific Telecommunications Council and Editor of the Pacific Telecommunications Review.

Which publication is read by more communications professionals?

ATUG - The Exhibition and Conference of the Australian Telecommunications Users Group is unquestionably the major communications event in Australia. Visitors to the annual event are widely considered to be the region's top communications professionals, responsible for the lion's share of its networking and telecommunications purchasing.

Upon registering at ATUG'93 visitors were requested to indicate the communications/networking publications they regularly read. Judging from the **4,690*** completed questionnaires *Australian Communications* is clearly the choice of communications professionals

" I regularly read...."



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ATUG AUSTRALIAN TELECOMMUNICATIONS USERS GROUP

From the desk of the Executive Director

Have Flexi-Plans Been Legitimised?

Wally Rothwell

All being well, a very important piece of legislation will have entered the Parliament during November, as an amendment to the *Telecommunications Act, 1991*. The amendment deals with the issue of the legitimacy on the one hand, and the anti-competitive effect on the other, of Telecom's Flexi-Plans and Strategic Partnership Agreements (SPAs).

One of the benefits of our new competitive environment is that users are at last being given some of the choices that they have been demanding for years, and flexible tariff offerings are a natural part of that environment.

However, Telecom and Optus watchers will be aware that there is dispute over some of Telecom's SPAs and Flexi-Plans, in particular those which bundle competitive and non-competitive service products.

The argument goes that if Telecom bundles together long distance services with, say, local calls in a Flexi-Plan, then this is reckoned to be anti-competitive because Optus or service providers say that they are unable economically to offer local calls.

By the time Optus has paid the average 3.14 cents per-minute-per-end interconnect fee to Telecom, the cost based on interconnect fees alone for an average domestic four-minute call is 25.12 cents. One might argue on the other hand, that business local calls average about 3.15 minutes, which would make the cost of those calls 20.41 cents. Then, after adding the cost of billing and underlying network costs, it just might be possible for Optus to provide a business local call for under 25 cents. That assumes, of course, that users stick to the average three-and-a-quarter minutes, and is obviously pretty marginal business for Optus.

So, it is said to be the position of Optus and some service providers that if, for example, long distance and local calls are bundled into an attractive Flexi-Plan or SPA package, then Telecom is taking an unfair advantage, which is anti-competitive in the long term.

Austel, which has a pro-competitive charter and which might be expected to step in and prevent what it sees as anti-competitive behaviour, was unable to do so because it did not feel that the *Telecommunications Act*, as written, gave it sufficient grounds to stop Telecom bundling services in a way which others thought was counter to the intent of the Act.

As a result, the Government has felt it necessary to amend the Act to make clear its intentions regarding Flexi-Plans.

Its intentions obviously are that users should be given the flexible tariff options of the nature of those presently on offer, on the condition that there are not resulting long-term adverse effects on competition.

ATUG, for its part, is also concerned about the long-term effects on competition. At the same time, we do not wish to see our members lose the considerable short-term gains that they have made. So we find ourselves in much the same position as the Government, trying to find a fair and equitable way through this dilemma.

Some months ago, when this issue was first raised by the Department, we made a submission which suggested some solutions to the problem and, in early November, we were sent a copy of the draft bill, making amendments to the Act, along with two draft Ministerial Directions.

While the draft Bill has followed a different route, it, together with the two draft Directions, follows the broad intent of ATUG's suggestions, and we are generally happy with it.

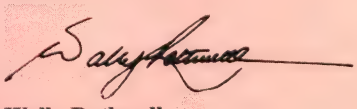
What we weren't too happy about was the fact that, four months after our original submission, we received the draft legislation from the Minister with only four days to comment! After a flurry of meetings and consultations with directors and members, we replied in just over a week.

What the new legislation does is legitimise Flexi-Plans and SPAs, but only where, in Austel's opinion, there is no long-term anti-competitive effect. Austel is given the necessary powers to disallow such tariffs.

The Minister is given the powers to direct Austel with regard to what is anti-competitive, and the two Directions do just that.

There has been considerable debate within ATUG about this matter, as it most certainly is a very important issue for our members.

We will be monitoring the progress of the legislation, which will not clear the House until early next year. We will also be happy to talk to any of our members about the matter, at any time.



Wally Rothwell
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ATUG Highlights in 1993

The last twelve months have seen ATUG involved in a number of areas as the telecommunications industry continues to adopt the new liberalised environment. Obviously the main event was ATUG'93 held in Sydney this year. The following summarises ten issues (in no specific order) addressed this year on behalf of members in these pages:

Pay TV

Pay TV is not an issue with which ATUG expected to become very involved, especially as much of the debate revolved around media ownership and programming. ATUG's position has been simply that Australia should try to catch up with the rest of the world in providing Pay TV services as soon as possible, and getting these services to consumers quickly by whatever technology providers wish to use.

Information Super-Highway

One of the pre-election undertakings of the Prime Minister was support for the construction of an information super-highway to Australian homes and offices, using a combination of fibre optic and coaxial cable. ATUG's main concerns are that this project should be developed in line with the user requirement, and that the network should be accessible to all at a reasonable cost. In addition, access to the network should be on an equal access basis.

Toll Fraud

ATUG warned users to check their telephone bills for hacker tracks because of user complaints regarding suspicious call charges. The need for general guidelines to address toll fraud and help with its prevention was recognised. Information of this nature would be welcomed from the carriers and telecommunications product suppliers — especially if specific guidelines could be developed for individual types of PABX, voice mail and other systems. These guidelines should disclose all the available steps that can be taken to configure the specific equipment and systems to avoid such fraud.

For its part, ATUG is investigating an insurance scheme, similar to that for computer fraud cover, so that members may cover themselves for the cost of toll fraud. Nevertheless, it should be noted that the onus is not only on users to protect themselves — it rests also with vendors and carriers to ensure that their products and services are provided with security features to prevent fraud. Obviously, such features would enhance the competitiveness of any telecommunications product in the marketplace.

Preselection

ATUG recommended, during the debate leading up to the *Telecommunications Act 1991*, that preselection should be the means by which customers connect to their carrier of choice. We made the recommendation with two objects in mind: firstly, selection of carrier should be made as simple for users as is possible; and secondly, both carriers should have an identically equal opportunity to win and maintain their customer base. The customer's choice will be registered at the local telephone exchange in order that the carrier can provide the customer with long distance and international service. However, if a customer has opted for, say, Optus, but wishes to take advantage of a Telecom special offer, the customer could access Telecom by using the four digit override code '1411.'

Flexi-Plans

The issue of whether Telecom's Flexi-Plans and Strategic Partnership Agreements (SPAs) are legal has achieved some prominence and has been contested in court by Optus. No matter what the eventual outcome of the court action, the Department of Transport and Communications has canvassed a number of options to amend the *Telecommunications Act 1991* in order to make clearer the Government's intentions about innovative and flexible tariff offerings. ATUG's position essentially is to ensure that effective and sustainable competition is not jeopardised, and we therefore feel that changes to legislation should only be undertaken in the special and particular circumstances where regulations or market forces cannot achieve the practical intentions of Government policy.

In this instance, however, ATUG has agreed to legislative action to resolve any doubts as to whether some of Telecom's discretionary charging options are permissible. Thus, ATUG has submitted to the Department that cost-based charging plans

FREE LEGAL LINE SERVICE

Members are invited to take advantage of ATUG's free Legal Line Service. The service is run by ATUG director and chairman of ATUG's Legal Sub-Committee, Gerald Wakefield. Members with legal queries in the following areas: international telecommunications law and regulatory policy; radiocommunications; broadcasting and satellite law and policy; computer technology law; and intellectual property law, are advised to consult this free legal advice service by calling ATUG on (02) 957 1333.
(A hotline for this service will be made available shortly.)

should continue to be permitted, as should non-cost-based plans, so long as any non-cost-based plans do not unduly affect the development of effective and sustainable competition or do not include any bundling provisions that could be considered anti-competitive.

We have suggested that it is anti-competitive to bundle services which are subject to competition with those services that are not. We have also recommended that Austel's two-day 'tick-and-flick' tariff approval process be extended to ten working days, with a further ten if Austel requires more time to review the tariff filing.

White Pages Directory

Telecom's licence requires it to provide a White Pages directory. Telecom has recently undertaken a review of its White Pages policy due to ATUG intervention, so that in its simplest form 'an entry containing the first appearance of a telephone number can be listed free of charge in the directory covering the area in which the service is listed. This free listing will include the customer's name, the street address at which the service is connected, and the telephone number allocated to the service. Business customers may also list a recognised occupation.'

Furthermore, additional entries (which can be up to 30 characters in length) for, say, a fax notation, will now cost $30p.a. per line, rather than the current charge of $94p.a. This revised policy will start to take effect from the first 1994 series of Telecom White Pages directories, beginning in Melbourne.

Number Portability

ATUG has been raising the issue of number portability with the industry regulator, Austel, for some time but progress on the matter has been slow. As a result, ATUG commissioned an independent study on portability. The results will be published shortly.

Standards & Carrier Performance

ATUG through the Standards Working Group 12/1 was able to be involved with the development of a draft checklist measuring carrier performance.

This checklist is a first for Australia, and will act as a guide for users and carriers so that artificial user expectations could be eliminated whilst giving carriers real objectives. The checklist includes aspects such as time-to-dial-tone, post dialling delay, inaccurate call connection, call drop-out, distortion and loss factors, cross-talk and call clearing delay.

New Service Levels

Telecom recently filed a tariff with Austel providing 'Standard Levels of Service' for most of its voice and data business products. ATUG's reaction to this filing is generally favourable, mainly because the standard hours of service have been extended significantly and because response and restoration times have been reduced to a more acceptable level.

While we are concerned that Megalink service is not being accorded the attention it deserves, the new levels provide a substantial improvement over the previously ambiguous terms of service.

TITAB

With telecommunications now being seen as an industry in its own right, the formulation of education and training policies for the industry has become another priority. To this end, ATUG together with Telecom, Optus and the Communications Workers' Union have joined forces to create a Telecommunications Industry Training Advisory Board (TITAB). It aims to address pressing education and training issues that are specific to the new competitive communications industry.

ATUG Director, Brigadier Neil Horn, and ATUG's Executive Director, Wally Rothwell, alternate as TITAB Directors. The manager for the Australian Electronics Development Centre Ltd, Chris Cartwright, represents ATUG on the TITAB Advisory Committee.

New ATUG Appointments in 1993

Deputy Executive Officer

The increased activity within the industry places substantial demands on ATUG and we have found it necessary to increase the management skill levels within the organisation.

Richard Allen has joined ATUG as Deputy Executive Officer and, as such, will report to the Executive Director, Wally Rothwell. He is responsible for the day-to-day running of ATUG. Richard has over twenty years experience in the tele-

ATUG

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communications industry. Originally involved in the technical side, most of his recent activity has been in the marketing of telecommunications products.

With senior roles at Australian General Electric, GEC Plessey Telecommunications and Mitsubishi Electric, Richard has a substantial amount of experience to bring to ATUG.

ATUG IN SOUTH AUSTRALIA

ATUG members in South Australia should take advantage of the guest speaker presentations organised on a monthly basis by the South Australian Committee. The meetings are held on the third Friday of each month from 4:30pm to 6:00pm. For further information, contact ATUG State Secretary, Peter Hamilton, on (08) 344 6743.

State Business Managers in QLD & WA

One of ATUG's founding members, Ray Poon, was appointed to the position of Queensland business manager earlier this year on a part-time basis. The appointment was made to expand ATUG's activities in Queensland. Ray was also a Board Director until 1989 when he was obliged in accordance with the Memorandum and Articles of Association to resign due to his retirement from the Commonwealth Bank.

In its endeavour to serve members in Western Australia, ATUG has appointed Geoff Groves as WA Business Manager. Geoff has an extensive background in computers, having worked for 21 years in computing within the mining industry. Geoff retired as Western Mining Corporation's WA Manager of Management Information Systems in July 1990. He has also worked as an engineer at the government aircraft factories in Melbourne, and additionally has held positions with Ansett WA and IBM.

Members in Queensland and Western Australia wishing to discuss issues on a local level may contact the ATUG Business Manager in their State as follows:

- QLD Business Manager, Ray Poon:
  P.O. Box B269
  Toowong, QLD, 4066
  Tel/Fax: (07) 870 4484
- WA Business Manager, Geoff Groves:
  33 Baldwin St,
  Como, WA, 6152
  Tel: (09) 450 3485
  Fax: (09) 313 2236

New ATUG Branch in 1993

Another highlight this year was the formation of the ATUG branch in the Hunter Valley. Rodney Gray was appointed branch secretary and John Croxson was appointed deputy secretary. Some of the organisations to send representatives to meetings include BHP, Coal & Allied, Hunter Area Health Services, the RAAF, Shortland Electricity, Hunter Technology, Telecom, the University of Newcastle and Wyong Council.

Christmas Message

ATUG would also like to thank all member companies who have contributed to our success during 1993, and wishes everyone a very Merry Christmas and a prosperous New Year.

ATUG Network Management Survey

Many members are eagerly awaiting the results of the major survey on network management issues conducted recently on behalf of ATUG. Indeed, we are grateful to the many members who provided an input to the process as sponsors, respondents or the provision of supplier input. The report is now available for purchase. The complete report, including quantitative data runs to over 40 pages, together with well over 60 pages of supporting information and suppliers' responses. The report is available at a cost, including postage and handling, of: $125 to ATUG members; and $200 to non-members. For copies of either the complete report or a copy of the Executive Summary, please complete the form below.

Please forward _____ (qty) copies of the ATUG Network Management Survey at $125 for each copy ($200 non-members) for which I enclose payment of: $_____

Please tick payment method (DO NOT send cash):

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☐ **Please provide a copy of the six page Executive Summary, free of charge to ATUG members only.**

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Tel: . . . . . .

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Forward to:
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Network Management Survey
PO Box 357
Milsons Point
NSW 2061

Frame Relay Gathers Pace

The interest in frame relay as a viable internetwork access service is rapidly growing. This was evidenced by the popularity of the Frame Relay Forum Education Seminar, held at Fujitsu on September 29, 1993 in Sydney.

Over 70 people attended the four hour event. Interest was highest among the vendors of frame relay hardware, software and services, accounting for 50% of the attendees. Around 30% of the attendees represented carriers and telecommunications service providers and 20% were from end user organisations. The Chair of the local chapter, Linda Clarke, said interest from the user community was welcomed, adding that user representation had grown to 20% now from only 2% at the first Frame Relay Forum event held at Manly last year.

The Education Seminar covered a number of presentations, including a Frame Relay Primer delivered by the Vice Chair of the local Australian/New Zealand Frame Relay Forum Chapter, Subra Venkat. Linda Clarke delivered the Opening Address and Chapter Update. The Forum Secretary, Michael Biber, spoke of the current status of Chapters operating in Europe and Japan.

Dr Hugh Butler, from Network Dynamics of New Zealand, described frame relay implementations in New Zealand, with special coverage of the TUIANET national facility. Ravi Bhatia from MCI described international frame relay services from the carriers' perspective, and Michael Richter from Telecom Australia, who is Chair of the Forum's Marketing Committee, described internal trials that were commencing.

Users should note that when trials of a public frame relay service operating on Telecom's Fastpac service are satisfactorily completed, the Telecom Board will make a decision regarding offering this service throughout Australia. It is anticipated that this decision will be made in early 1994. Clearly this is the time for both users and vendors to seriously consider their positions and implications of public frame relay networks.

Paul Simmonds from IBM Australia described the wide product offerings from the IBM systems portfolio which support and interwork with frame relay solutions. The seminar series was completed by Darryl Winder of Scitec, who discussed interesting applications for voice and other isochronous services over frame relay networks.

Attendees were also given a hands-on demonstration of frame relay LAN interconnect solutions by Interlink Communications using their Ace routers, Ascom-Timeplex and Time LAN 100 routers, connected over Scitec's Fastlane bandwidth managers. In addition to the LAN interconnect achieved in this demonstration network, Scitec demonstrated the same Fastlane frame relay backbone carrying voice traffic.

This event was a great success. The next event scheduled for the Frame Relay Forum in Sydney combines an education seminar and the AGM scheduled for February 1994. The next Victorian Special Interest Group (VICSIG) is scheduled to meet on December 16, 1993.

For further information on these, or any aspect of the Forum's activities, please contact Francesca Dolly at the Frame Relay Forum secretariat on (02) 975 2582 or fax to (02) 452 5397.

December

6-7 **ISDN '93**, Sydney Marriott Hotel. With the imminent launch of Optus' new ISDN service, this technology is undergoing a worldwide resurgence, and is only now beginning to realise its full potential. This event covers ISDN issues and questions, providing a global perspective of ISDN, a look at new ISDN applications, and the benefit of other users' experience. Fee: $1,295. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

6-7 **Mobile Satellite Communications in Asia**, Conrad Hotel, Hong Kong. This event focuses on the commercial opportunities that will continue to develop through the globalisation of communications. There will be keynote speakers from Optus Communications, Indonesia's Satelindo, and Japan's JCSat, as well as addresses by international market leaders in global mobile satellite communications, Inmarsat and Comsat. Other topics will include spectrum, frequency and standards and technical trends. Fee: $US1,495. Enquiries — AIC Conferences Tel: +852 520 1481 Fax: +852 866 7340.

6-8 **PABX and Voice Networks**, Housley Communications, Sydney. This seminar will provide a working knowledge of public voice networks and the basic products and services offered by the carriers, as well as an overview of data communications networks. Other topics covered include intelligent networks, PABX design, cabling issues, acquisition and management, integrated networks, and cost analysis and control. There is an optional two-day workshop where attendees will work through a practical example of voice network design. Fee: three-day seminar $1,315; two-day workshop $875; combined seminar and workshop (five days) $1,965. Enquiries — Housley Communications Tel: (02) 499 2666 Fax: (02) 498 7669.

6-10 **TCP/IP Networking**, Sydney. This three-day seminar and two-day workshop offers an overview of TCP/IP protocols and products and allows attendees to configure and test a TCP/IP network. Fees: seminar only $1,315; two-day workshop $1,125; five-day combined course $2,215. Enquiries — Housley Computer Communications Tel: (02) 499 2666 Fax: (02) 498 7669.

6-10 **Client/Server Architecture**, Housley Communications, Melbourne. This seminar looks at the client/server concept and covers trends in distributed computing; implementation, distributed data, network and communications issues; workgroup computing; and security. An optional three-day Implementation workshop will look at the design of client/server systems and related issues. Fee: two-day seminar $875; three-day Implementation workshop $1,315; seminar and workshop $1,965. Enquiries — Housley Communications Tel: (02) 499 2666 Fax: (02) 498 7669.

7-8 **Mobile Data**, Gazebo Hotel, Sydney. This conference will cover all aspects of this new technology including an overview of how Telecom's Australian network will operate, R&D developments in both hardware and software, building a mobile data system and potential market applications. There is also an optional one-day workshop. Additionally, the event will feature an exhibition of the latest equipment from leading vendors. Fee: conference only $595; conference and workshop $1,095; workshop only $595. Enquiries — Housley Computer Communications Tel: (02) 499 2666 Fax: (02) 498 7669.

7-9 **Pan-Asian Telecommunications Summit '93**, The Regent, Bangkok. With the Asian telecommunications market expected to exceed $US100 billion over the next five years, this conference aims to give delegates first-hand insights into telecommunications policies, regulation, investment and market opportunities. There will be top level regional and international experts on regulation and planning, and case studies which cover a wide range of experiences in regional telecommunications development. Fee: $US1,895. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

January 1994

16-20 **16th Annual Pacific Telecommunications Conference**, Sheraton Waikiki Hotel, Hawaii. This year's conference has the theme 'Forging New Links,' and looks at the developing economies of Asia, Oceania and the Americas. The issues of technology transfer, education, commerce, information services, human resource development, restructuring and trade will all be covered, as will the future impact of new technologies. The event will attract around 1,100 delegates from over 40 countries, as well as top personnel from carriers, suppliers, government and international organisations. Enquiries — PTC Tel: +1 808 941 3789 Fax: +1 808 944 4874.

February 1994

14-16 **TCP/IP Networks**, IIT Training, Sydney. This three-day course takes a comprehensive look at TCP/IP networking issues, covering topics such as TCP/IP addressing and address classes; routing protocols; the use of subnet masking; protocol formats and their interpretation; how TCP/IP-related protocols work; and network management. The course programme also includes hands-on practical sessions each afternoon. Also to be held in Melbourne, 21-23 February. Fee: $1,445. Enquiries — ITT Training (02) 252 2844 Fax: (02) 247 1048.

21-22 **Cabling '94**, Hotel Inter-Continental, Sydney. This conference helps delegates make the right choice when installing and relocating cabling, to ensure their organisation has a solution which encompasses flexibility, durability and efficiency. An optional third day offers a half-day conference and workshop on fibre optics. Fee: Two-day conference $1,395; conference and fibre optics workshop $1,895; fibre optics workshop only $795. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

March 1994

2-4 **IT Security**, National Convention Centre, Canberra. This two-day conference will help delegates determine their major information security concerns, and to develop policies and strategies to ensure their organisation's data is adequately protected. The programme aims to show how by learning security measures that can be taken to protect confidential information, network staff can effectively guard their organisation's data from both internal and external threats. There is also an optional third-day workshop on risk assessment, which will teach methodologies to determine risk exposure. Fee: conference only $1,395; conference and workshop $1,895. Enquiries — IIR Conferences (02) 954 5844 Fax: (02) 959 4684.

10-13 **Telemex '94 and Elec-com '94**, Putra World Trade Centre, Kuala Lumpur. The Telemex '94 exhibition will display state-of-the-art business automation and telecommunication systems, while the Elec-com '94 exhibition is targeted at the rapidly growing market of electronics and computer users, and will feature the latest products in these fields. Enquiries — Excel Exhibitions Tel: +60 3 244 0669 Fax: +60 3 244 0670

21-22 **LAN-WAN '94**, Hotel Inter-Continental, Sydney. This 3rd annual conference aims to keep delegates abreast of the latest technologies in the fast-changing world of local area networking and wide area networks. A forum of international experts will present the new developments and applications of networking protocols, and case studies will be presented to demonstrate technologies such as remote boundary routing, switched internetworking and wireless LANs. An optional half-day workshop will present the latest strategies in network management. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

April 1994

11-15 **Investments and Joint Ventures in Asia-Pacific**, Hotel Intercontinental, Sydney. A business summit staged by the International Computers and Communications (IC&C) organisation aimed at the development of international alliances and investments. Chaired by Richard Butler, it will bring together leading personalities, investors, and business leaders from across the computer, communications and telecommunications sectors from the European, North American and Asia-Pacific regions. Enquiries — IC&C World Leaders Council Tel: +1 703 476 0654 Fax: +1 703 476 2924.

25-29 **Africa Telecom**, Cairo International Conference Centre, Cairo. This event will attract the industry's leading speakers and 150 exhibitors from around the world. The theme for this year's conference is 'Integrating Africa Regionally and Globally,' and will cover telecommunications financing and investment in Africa, regional tariff structures, infrastructure development and broadcasting and technologies for remote areas. Africa and the Middle East region is an important telecommunications market, with an estimated demand for new telephone subscriber lines of 16 million and predicted investments of $US24 billion before the end of the century. Fee: SFR1500. Enquiries — ITU Africa Telecom 94 Forum +41 22 730 5811 Fax: +41 22 730 6444.

May 1994

2-5 **ATUG '94**, Royal Exhibition Buildings, Melbourne. With the theme of 'Smart Communications for Smart Business,' the 11th annual exhibition and conference of the Australian Telecommunications Users Group will feature a variety of international and domestic speakers and exhibitors. A special emphasis will be placed on data networking in Australia. Enquiries — ATUG Tel: (02) 957 1333 Fax: (02) 925 0880.

July 1994

3-6 **International Telecommunications Society 10th Annual Conference**, Sydney Convention Centre, Darling Harbour, Sydney. This year's conference will look at the convergence of telecommunications, mass media and computer technologies brought about by developments in intelligent interconnected systems. Major elements of competition have been brought to a formerly largely non-competitive sector, resulting in new industry structures and changes in pricing, technologies and capacity, and organisation and management. The conference will focus specifically on the areas of broadband infrastructure and user requirements; regulation of the industry; issues of competition; the contribution of telecommunications to economic growth; and the social aspects and implications of new communications technologies. Enquiries — Donald Lamberton, ITS Tel: (06) 249 3884 Fax: (06) 249 0312.

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- Optional headset support
- Plus all IQTEL common features
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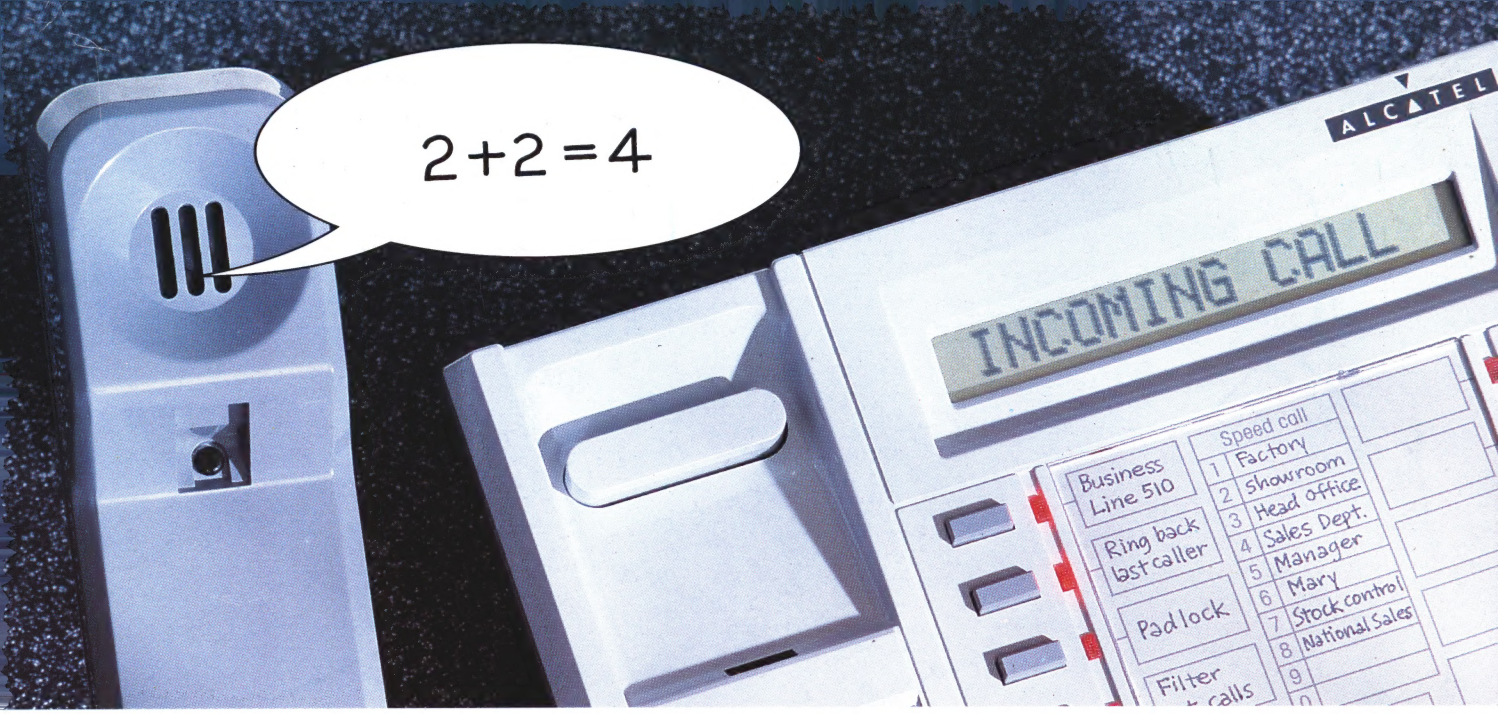
Only products that carry an AUSTEL permit have been tested to meet AUSTEL's safety and technical standards



A PABX so smart, it can do its own accounting.

Unlike most PABX systems, the Alcatel 4300 can support an integrated Call Accounting System without any external software, or a personal computer. Which means there's no additional hardware maintenance or third party software costs, and no potential point of failure. All outgoing call costs can be stored on disk and output on a printer, for individual extensions or departments.

The 4300 is so smart it can even identify the person making the call and apply different charge rates across a number of cost centres. It can even display call costs on digital phones. Alcatel Australia. We're Australia's largest communications company, because we know how to compete.

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